THE IRON AGE — January 4, 1934

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SEVENTY-NINTH YEAR OF SERVICE TO THE METAL WORKING INDUSTRY

A *New* Year . . .
A *New* Challenge

THE CHALLENGE that 1934 brings to the steelmaker, as to all suppliers to industry, finds Bethlehem prepared. Refinements in metallurgical practice, continuous improvement in steel-making, place Bethlehem in advantageous position to meet the changing demands of the new era. Users of steel who put their problems up to this company enlist the services of an organization able to draw on unusual facilities and experience, and pledged to maintain a traditionally high standard of quality.

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District Offices: Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Milwaukee, New York, Philadelphia, Pittsburgh, St. Paul, St. Louis, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Honolulu. *Export Distributor:* Bethlehem Export Steel Corporation, New York.

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JANUARY 4, 1934

ESTABLISHED 1855 Vol. 133, No. 1

Cost Will Write the Verdict

What of 1934?

Will it be for better or for worse in the metal-working industry?

Will volumes and profits be rebuilt, during its months, so that capably managed concerns may once more dismiss the dismal nightmare of dwindling assets?

No one but Father Time can answer these questions. And before he does so, he will examine the cost sheet.

Cost will decide, during 1934, the practicality of wage fixing by code agreements. Cost to the consumer, who will shortly be asked to shoulder the load which industrial capital, with non-existent profits, has been carrying.

Cost, not Congress, will settle the matter of collective bargaining, and the form that it should take. Cost to the worker, to the employer and to the consumer.

Cost, in fact, will write the epitaph of the Recovery Movement and its Administration. Not in 1934, perhaps, will this epitaph be inscribed, but in the coming decade, when the bills are handed to the taxpayers for payment.

And *cost,* during the coming year, will sign either the death warrant or the new lease on life of many an individual company.

* * * *

As the new year begins, these are pertinent thoughts for all of us, rulers and ruled alike, who in these past few hectic months of emergency have been forced to "reckon without the cost."

But that cannot be done indefinitely, as many a spendthrift has learned to his sorrow. Gigantic spending will not make us all rich. It may make us all poor.

The old-fashioned and now out-of-vogue idea of *saving* must be reborn in 1934 if we are to regain a normal and durable well-being.

Particularly must we resurrect the idea of cost saving.

For cost savings alone can finance the rebuilding of American prosperity; cost savings in production and in distribution. We

cannot increase our collective wealth by trading shoe laces for chewing gum, no matter how high we may mark the price tags or how large may be the volume of business.

Cost savings secured through research, invention, development of materials and machinery in the metal-working industry are the fundamental sources of future wealth, just as they have been the chief builders of past prosperity.

* * * *

FATHER TIME is a shrewd creditor and a stern collector. When it comes time for us to pay, we may offer him Utopian dreams, mandatory wage rises, pegged prices and "buy more" ballyhoo. But he will not accept them as legal tender. He will say to us, "*produce your cost savings*, for they alone can pay your bill for recovery."

JOHN H. VAN DEVENTER
Editor, THE IRON AGE

A Survey of The Metal-Working and Machinery Industry

Facts and Opinions Drawn From The Experience of 245 Companies

HOW is the metal-working industry faring under the current process of codification? What are its expectations for the first quarter of 1934? What is the status of its labor relations?

These and other vital questions are answered in the accompanying survey, which is a sufficiently large and diversified cross-section of the industry to be typical of its movements and its opinions.

Of particular interest and significance to our readers will be the comments concerning the industry's most serious immediate problems. These comments, in volume and quality, form an impressive resumé of opinion in the industry.

Some Broad Conclusions from the Survey

Majority believes that increase of farmers' purchasing power will be the most powerful stimulant to the metal-working industry.

• • • •

Metal-working industry is practically 95 per cent NRA, either through signed codes or by President's agreement.

• • • •

Only one out of every three companies has been able to offset increased costs, under code operation, by higher prices.

• • • •

Yet the great majority believe that NRA will eventually work out to their benefit through establishing better trade practices.

• • • •

Trend of sales volumes has been progressively downward in majority of metal-working concerns for October, November and December.

Yet payrolls and employment have gone up in a majority of cases.

• • • •

Price chiseling, except in basic materials, has been by no means as yet eliminated.

• • • •

Labor relations have not been disturbed in a large majority of companies.

• • • •

There has recently been a noticeable decrease in the activities of union organizers.

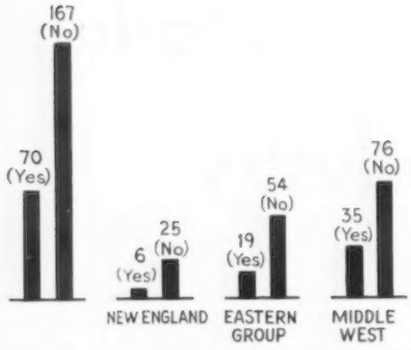
• • • •

Of 214 concerns, nine have recognized unions for the purpose of collective bargaining. Five more expect to do so. The rest do not.

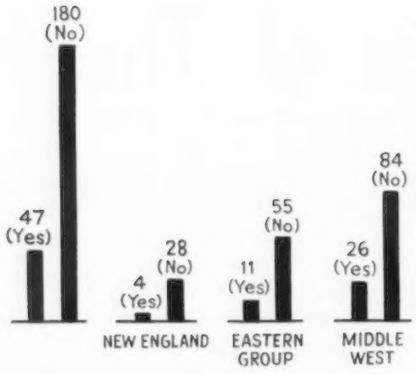
• • • •

Export opportunities are reappearing with the trend toward a cheaper dollar.

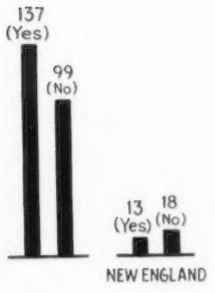
BUSINESS



DO you expect that public works allotments will materially increase your business during the first quarter of 1934?

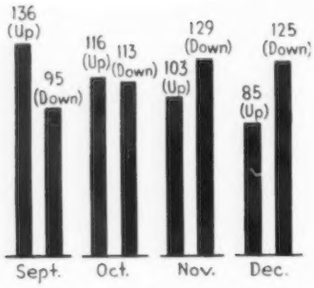


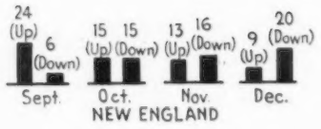
DO you notice an increase in railroad buying or expect that it will materially affect your business during the first quarter of 1934?



WILL an increase chasing power of ers directly affect

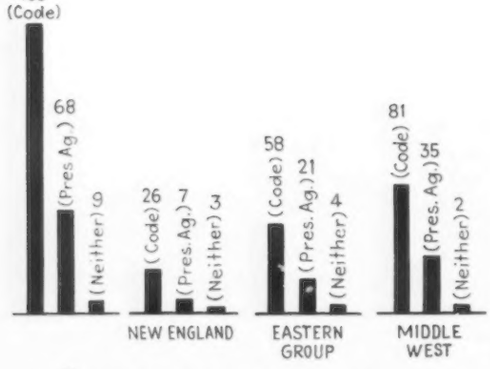
SALES VOLUME TRENDS



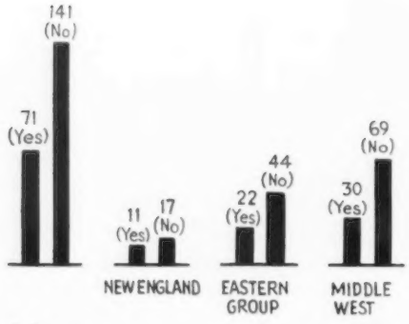


A COMPARISON of the number of companies making sales gains with the number

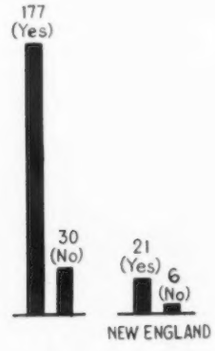
OPERATION



COMPARISON of number of plants operating under codes, President's Agreement or neither.



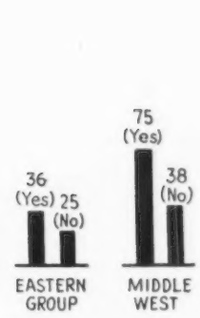
HAVE you been relieved, in sales competition, of price chiseling?



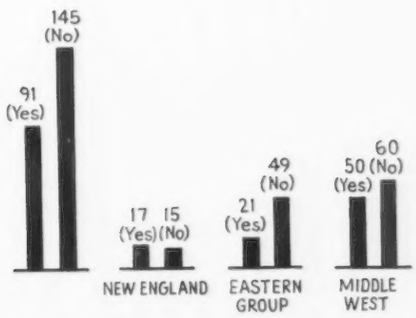
AS a seller of you feel that NRA establishing better

Southern and Far Western

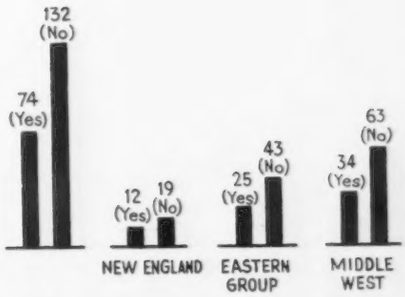
EXPECTATIONS



in the relative pur- agricultural produc- your business?

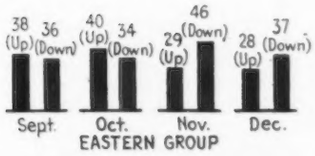


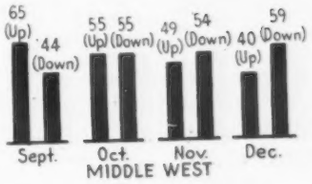
DO you anticipate increased business for your company from the automobile industry during the first quarter?



HAVE you noticed increased export opportunities due to the decreased value of U. S. dollars?

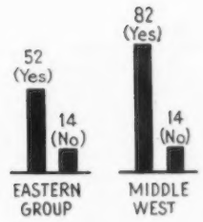
IN LAST FOUR MONTHS



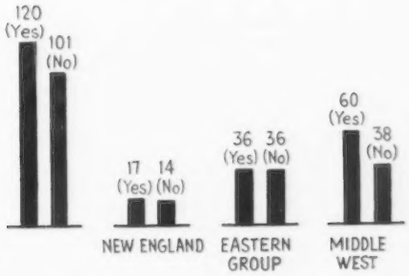


of those reporting sales losses for September, October, November and December.

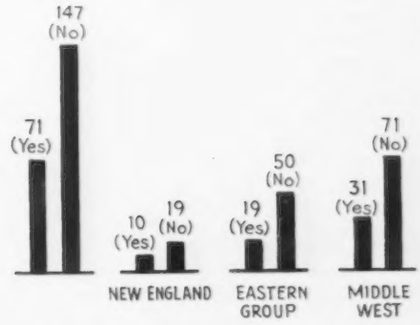
UNDER CODES



metal products, do will benefit you by trade practices?



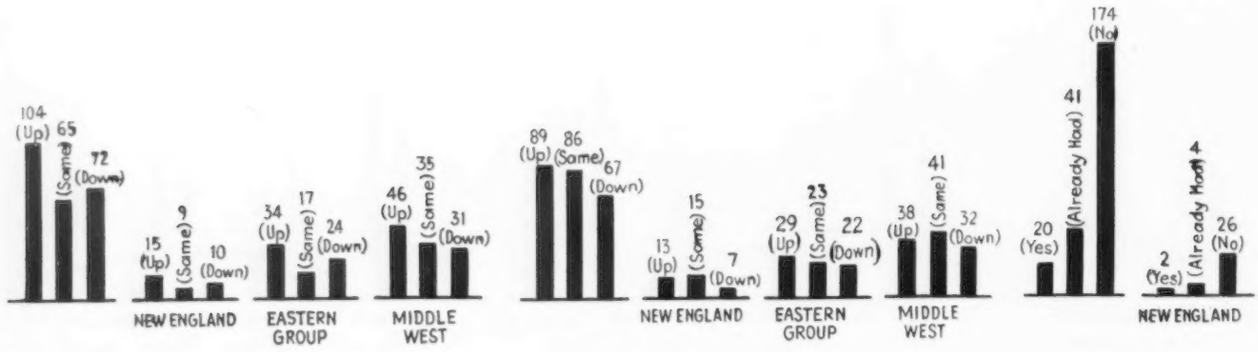
AS a buyer of industrial products, equipment and supplies, has the operation of other codes of these supplying industries worked out to your disadvantage?



DO you find that the increases in prices at which you sell your products have offset increases in cost incident to NRA operation?

Returns Not Tabulated

EMPLOYMENT, WAGES



HOW does your present payroll compare with that of first payroll period in September?

HOW does the total number of employees engaged at present compare with the number employed during the first September pay period?

ARE you setting employee

What Do You Consider to Be The Most Serious Pro

FOLLOWING are the illuminating replies which were given to this question. Because of their variety it is impossible to reduce them to tabulation, so they are reproduced individually, except in the few cases where they coincide.

His Problem Is Selling NRA to His Customers and Salesmen

Selling NRA and the code principles to each of our sales representatives and convincing them that our competitors' salesmen will adhere to the principles of the code as strictly as we expect our men to adhere to the code principles, and thus turn a deaf ear to innuendo.

From a manufacturer of mechanical handling and conveying machinery.

* * *

Sees No Help for Small Business Under NRA

We cannot feel that small business will be helped by NRA. The increased cost of doing business hurts the little concern which finds price increases difficult to make. This presents a serious situation to concerns of our size.

From a manufacturer of timers and automotive devices.

Wants Adequate Volume to Bolster Employment

Obtaining adequate volume of sales for steady employment of all our skilled men. If users unduly postpone replacement of old or obsolete equipment, a peak demand will come later, and users will have to pay higher prices, and wait for deliveries. The wise ones are buying replacements now.

From a manufacturer of machine tools.

* * *

Proposes Recognition of Same Elements of Cost Among Manufacturers for a Given Product

Requiring all of the makers of similar items, including railroads manufacturing in their own shops, to recognize the same elements of cost for a given product, and some effective means set up to deal with those who for any reason whatsoever offer to sell anything below cost of production; said cost of production to be set by the industry as organized.

From a manufacturer of brake beams, railroad car parts and metal stampings.

Blames Baloney Dollars and Uncertain Experimenters

I believe that the present state of total stagnation in our line is not so much due to NRA as to the fluctuating value of the dollar, and the uncertainty of the experimenters at Washington. There is plenty of good business, just waiting and hesitating. The uncertainty makes new capital investments very cagy and shy.

From a dealer in machinery.

* * *

Sees Too Much Haste in Codifying Industry

The lines which we manufacture, although the number of our products is comparatively small, apparently would be classified under at least four and possibly five codes, all of which differ to quite some extent, both in their hours of labor, minimum wages, and trade practices.

It appears to us that the Federal Government was entirely too hasty in attempting to codify all industry throughout the country, and, in fact, practically compelling industry to formulate codes within a short period of time, which did not give a sufficient opportunity to consider all matters carefully, so that the result is simply confusing.

Judging from statistics there was, apparently, a real recovery under way prior to the time that these codes were forcibly installed, and since that time business in all directions has declined to a large degree.

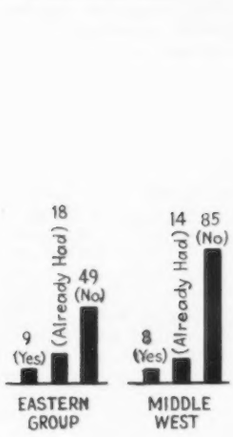
While, undoubtedly, regulation in certain directions may have been an absolute necessity, we believe that the business recovery should actually have been encouraged first, and regulation taken care of later.

Further than this, the matter of codes seems to be based on a governmental assumption that the depression and all troubles were caused by difficulties in industry itself, and not from outside effects. We honestly believe, however, that quite the contrary is the case, and that regulation was needed in only a small proportion of industry, which could easily have been taken care of in an entirely different manner.

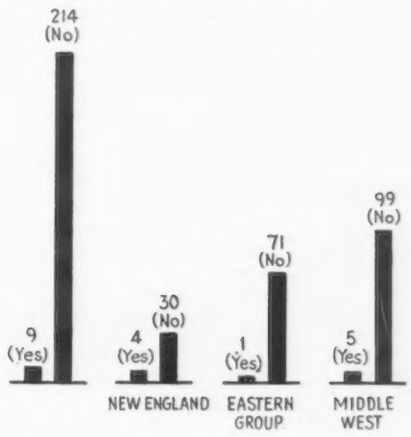
It is also our opinion that there is a large latent demand now developing, and if the uncertainties and fears arising from the Federal program can be allayed, there is no question but that there will be a decided improvement in business during the season of 1934.

From a manufacturer of crushing, screening, and washing equipment.

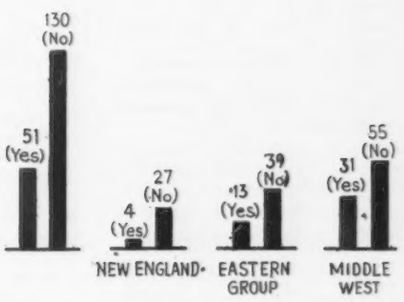
AND LABOR RELATIONS



up any system of representation?



HAVE you recognized any "trade union" for purposes of collective bargaining, or, if not, do you expect to?



DO you notice any decrease, recently, in the activity of union organizers?

blem Now Confronting Your Division of The Industry?

Wants Sound Money

Monetary uncertainty and labor troubles caused by the N.R.A. If a sound money basis were established and if the NRA were wiped out, we would unquestionably be improving the same as Europe.

From a manufacturer of mill machinery, chilled iron rolls, hydraulic presses, etc.

• • •

Finds Lack of Finances for Purchasers

Inability on the part of prospective purchasers of our class of equipment to get the necessary financial aid to cover the initial investment (down payment, freight, installation cost and initial supplies).

From a manufacturer of dry cleaning machinery and equipment for small plants.

• • •

Decries Business Regulation by Professors

The continuous interference of illogical regulation of business by impractical professors and the waste occasioned by the ever growing army of government and political parasites. The use of men raking up a few leaves, or as observed here, a small army on one of our beaches, who yesterday dug holes in the sand and today filled them up, means a burden of taxes on every manufacturer and corporation which will prevent natural expansion and the proper remuneration of their employees.

From a dealer in used machinery and equipment.

• • •

Restricted Work Week and Shortage of Skilled Labor Prove a Problem to This Company

The fact that we can run but 40 hours per week and the shortage of skilled labor to handle our work. Also the high wages that must be paid female and young male help, which is far beyond the value of the work performed.

From a manufacturer of screw machine products, automatic die heads, etc.

• • •

Bank Loan Restrictions and Stabilization a Problem

Lack of a stabilized currency—lack of bank cooperation—no loans—no mortgages—and yet assets are not security for any bank loans to build up on. We are our own bankers, but it makes for slower progress.

From a manufacturer of flexible shafts and machines for portable work.

Availability of Funds for Purchases a Problem

We specialize in proprietary equipment for the Navy, Army, merchant marine, and aeronautical services and, therefore, our most serious problems are those which have to do with the availability of funds for the purchase of our products and with our own ability to satisfy the customer's requirements.

From a manufacturer of gyro-compasses, automatic steering equipment, etc.

• • •

Build Up Morale of Farmers

To build up the morale of the agricultural classes who buy most of our merchandise, and to eliminate the unrest and reactionary attitude of farmers, fruit growers and agriculturalists generally.

From a manufacturer of hand tools and farm equipment.

• • •

Protests Domination of Code Control by Small Number of Large Corporations

Domination of industry by a few very large corporations who, by the weighted system of voting in our code based on volume of sales, can dictate prices and policies. The companies with the best and largest sales organizations will gather the crop.

From a manufacturer of centrifugal pumping machinery.

• • •

Finds Government Competition in Labor

The costly government competition, to be paid for by the taxpayer, in the scale of labor passed out in the form of unemployment relief disturbs labor in our industry. Labor is encouraged by these practices to demand a higher scale of pay than existing conditions make it possible to pay.

From a general jobbing founder and machinist.

• • •

A Galaxy of Problems Confronts This Manufacturer

Severe labor problems. Insufficient flexibility to handle highly special, custom, production. Serious material delays resulting from restricted hours permitted our suppliers. Extremely unreasonable increase in operating costs resulting from loss of efficiency and general confusion, which without a doubt will be overcome gradually but at

tremendous cost to the company.

From a manufacturer of motor coaches, delivery vehicles, trolley buses, etc.

* * *

Finds Lack of Balance Between Cost of Purchases and Prices Received a Problem

Maladjustment between prices paid for purchases and prices received for product during this period when all industries are not under N.R.A. or codes. Ruinous prices are still being quoted by competitors.

From a manufacturer of drop forgings and metal stampings.

* * *

Problem Is Governmental Interference

Too much governmental interference, and as administered by men who cannot know the ins and outs of small industry which the individuals and owners have required years to build up.

From a manufacturer of agricultural tools.

* * *

Price Chiseling Condemned

Price chiseling—using raw materials out of inventories instead of present market prices. Therefore we are unable to meet the situation as our code provides market prices at time of quotation shall be used. When inventories are exhausted we believe the present condition will disappear.

From a manufacturer of automatic screw machine products.

* * *

Finds Problem in Lack of Capital Investment in New Building Construction

Lack of capital investment in new building construction, due partially to lack of stabilization of dollar, partially to code restrictions regarding expansion, but primarily from restraint of credit by banks.

The lack of an approved code is also handicapping our branch of industry, namely structural steel and iron fabrication.

From a manufacturer of structural steel, ornamental iron, and gray iron castings.

* * *

Increased Costs and Operation Problems Under NRA Without Compensating Benefits

In our own industry, increased costs and problems of operation under NRA without compensating benefits. Labor under A. F. of L. is good, but radical element in locals is very difficult to handle and demands "action" to show its power. The indeterminate dollar is very serious, and a lack of basis for future contracts is terrible.

From a manufacturer of elastic and non-elastic fabrics, brake linings, etc.

Decries Lack of Sales Opportunities

Lack of sales possibilities, and too many concerns going after what little business there is available. Foreign competition (German chucks especially) is a real menace at present.

From a manufacturer of lathe and drill chucks.

* * *

Asks Support for Capital Goods Industries

It is now generally well-appreciated that the capital goods industries have not received the attention from the administration that it is necessary to have in order to put these industries back on their feet. In fact, the capital goods industries should have been given the first lift, for the reason that they to a large extent form the basis of prosperity in the consumer industries. Unless more attention is given to the capital goods industries, the whole recovery program will be out of balance.

From a manufacturer of gear shapers, gear shaper cutters, burnishing machines, etc.

* * *

Problem Is Elimination of Price Chiselers

It appears the Federal code authorities are so busy studying proposed codes that they do not have sufficient time to give to the problem of apprehending and prosecuting code price violators and companies who use subterfuge to defeat the purpose of President Roosevelt's plan.

From a manufacturer of fireproof steel building products of all kinds, etc.

* * *

Wants a Middle Course for Currency and Credit

To put confidence into business so people will buy. This can be done by a statement from the President, now so long overdue, that he is shooting for a middle line within these monetary ratios:

Now 2½ units of gold to one of currency to sixteen of credit and

Normally 1 unit of gold to 2½ of currency to fifty of credit.

From a manufacturer of production machinery.

* * *

This Problem Is One of Pigs, Chickens, and Barnyard By-Products

The most serious problem in our business has been farm prices on hogs, poultry, and general farm commodities. Our products sell mostly to the farm trade.

From a manufacturer of pressure gas stoves, appliances, etc.

Finds Code Restrictions a Problem

Restrictions placed in codes on giving away, loaning, etc., of display racks, and the hesitancy of concerns to buy because of fear of possible restrictions in codes. Also the inability to raise prices to take care of increased costs.

From a manufacturer of spot welded wire specialties, etc.

* * *

Suggest Adopting All Codes at Once to Relieve Uncertainty

Have all of the codes adopted at once, and relieve the uncertainty hanging over us due to this cause. Once they are adopted leave them alone for a period of 6 months so we can adjust our affairs accordingly.

From a manufacturer of broaching tools.

* * *

Finds Disproportion Between Prices of Hot and Cold Rolled Steel

Aside from the labor situation, which no doubt will present many vexing problems in the future, we consider that the most serious problem concerning our division of the industry is the tendency of the large steel companies who produce both hot rolled and cold rolled material, to advance the price of the hot rolled material entirely out of proportion to the advance of price on the cold rolled. This is a serious problem with the small mills who do not produce their own raw material.

There is also another feature along this same line that is very serious, and that is the tendency of the producers of hot rolled steel to demand extras for steel of certain analyses, or certain range of analyses, on which heretofore no extra has been charged. Under these conditions it is obvious that if the small mills who do not produce their own hot rolled steel, have to pay these extras, it gives the mills who produce their own hot rolled steel an advantage to which they are not entitled.

On the whole there are many inconsistencies that we believe the industry should eliminate themselves rather than to have somebody else force them to do so later on. We do not know whether it is intentional or not, but thus far we feel that in a general way the development of the NRA has worked more of a hardship on the small concern in the steel industry than on the larger ones. The cost of production has increased much more in proportion than the increase in the price of our finished products.

From a manufacturer of flat cold rolled strip steel; also both flat and round wire for special requirements.

Place Emphasis on Cost Problems

The rapid increase in the price of raw material and steel, together with the low prices for farm products, so that the farmer cannot buy.

From a manufacturer of windmills, pumps, and farm water supplies.

* * *

Trying to obtain sales at prices increased so as to balance increased costs of labor and materials. We build to order only and customers are very critical of any price increase.

From a manufacturer of industrial ovens and dryers.

* * *

Justifying price increases made necessary by increased costs of suppliers blamed on NRA operations, and securing new business.

From a manufacturer of machine tools, automotive and industrial clutches.

* * *

Inability to advance selling prices to meet increased costs. Business shows sharp decline at announcement of higher prices.

From a manufacturer of bakers' equipment, water softeners and special food machinery.

Increased costs due to, 1. higher steel cost; 2. higher labor costs; 3. higher overhead due to shorter hours. These factors together raise costs faster than purchasing power.

From a manufacturer of forged hand tools.

* * *

The expense and annoyance of NRA has far offset any possible advantages.

From a manufacturer of gears.

* * *

Increase of costs through the code; no adequate guarantee of price increase or protection in case of increase from chiselers.

From a manufacturer of agricultural tools.

* * *

No one will advance prices in proportion to increased costs in the spring industry, resulting in heavy losses.

From a manufacturer of mechanical springs, wire forms, metal stampings.

* * *

Rigid enforcement of the steel code as to prices, terms,

and insistence of taking steel now at current prices on the one hand, and having to sell to equally strong organizations on the other hand, who will allow no price advances.

From a manufacturer of drop forgings.

* * *

Unreasonable advance on steel from warehouses and steel manufacturers. Extras are unwarranted as now in force.

From a manufacturer of small garage tools, replacement parts, etc.

* * *

Quantity extras on soft steel, tool steels and alloys. They are prohibitive to the small jobber, and we believe were put in force by the large producers, who maintain their own warehouses for this purpose.

From a jobber.

Labor Relations the Chief Problem

Labor union activities, which may induce trouble in a set of employees who are being very fairly treated and who would be contented if not disturbed by unions.

From a manufacturer of envelope and special paper-handling machinery.

* * *

CWA rates upsetting labor conditions.

From a manufacturer of machine tools.

* * *

The uneasiness and uncertainty caused by the decline in business and by the fact that labor trouble is apt to start anywhere and at anytime.

From a manufacturer of gears and sprockets.

* * *

Establishment of same minimum hourly rate for boys after 60 days apprenticeship as for experienced class of tradesmen.

From a manufacturer of automobile body stampings and accessories.

* * *

Shortage of skilled workmen.

From a manufacturer of steel derricks and equipment for petroleum industry.

Trade Practices and Unfair Competition

Lack of cooperation of allied industries to establish and police fair trade practices.

From a manufacturer of springs of all types.

* * *

Lack of purchasing official cooperation with NRA manufacturers.

From a manufacturer of spring washers, rings, springs, keys, etc.

* * *

How to successfully compete with firms making a similar line of merchandise but not operating under the same code we are.

From a manufacturer of gears and speed reduction machinery.

* * *

Price cutting still confronts gear industry, but we believe, as manufacturers get a little more business, there will be less and less price cutting.

From a manufacturer of gears.

* * *

To properly police our particular code in the industry.

From a manufacturer of screws, nuts, and specialties.

* * *

Selling drop forgings below cost and giving away dies and tools.

From a manufacturer of drop forgings.

Price chiseling.

From a manufacturer of drop forgings.

* * *

Price cutting or selling below cost.

From a manufacturer of job stampings.

* * *

Unfair trade guarantees. Competition from those outside the industry working into new lines.

From a manufacturer of hand tools for garage mechanics.

* * *

Proper enforcement of code of fair competition of our industry. If not properly policed our code will be of no value.

From a manufacturer of special screw machine products.

* * *

The injustice of the steel code with regard to small buyers, such as ourselves, and large competitors attempting to run the whole show regarding policies and price.

From a manufacturer of metal stampings for the furniture manufacturer.

The very small foundry can keep a low price in effect, thereby causing the foundry with an organization to continue to quote low prices.

From a manufacturer of foundry products.

Decline in Investment and Lack of Credit

Lack of interest of private capital that will not or cannot compete with the politicians and government.

From a fabricator of structural steel and warehouse operator.

* * *

Our industry is dependent on railroads and their condition governs ours. Government subsidization of competing forms of transportation and excessive regulation of railroads limits railroad returns.

From a manufacturer of gasoline operated railway motor cars for small gang use.

* * *

Lack of railroad and general construction buying, and increasing material costs.

From a manufacturer of lifting jacks and drop forgings.

* * *

Over supply of buildings, office, factory and commercial, plus the heavy financial involvement of real estate.

From a manufacturer of passenger and freight elevators.

* * *

Lack of building, and ruinously low prices for one division of our business.

From a manufacturer of radiators, boilers, bath tubs, etc.

Financing of new building projects.

From a manufacturer of ventilating registers and grilles, etc.

* * *

Money situation. We have a bank closed which we have done business with for 40 years. We consider banking examiners absolutely incompetent.

From a manufacturer of oil field pumping engines and supplies.

* * *

Progressive reduction in sales plus hampering restrictions in production and certainty of higher taxes.

From a manufacturer of clayworking, grinding and mixing machinery for coke ovens, etc.

* * *

Uncertainty and confusion caused by interference with natural economic forces and monetary problems.

From a manufacturer of metal stampings and production equipment such as dies, tools, etc.

* * *

Lack of general release of credit, and the slowness of the government in releasing the frozen deposits of March 6th. The political policy of restraint in bringing labor to realize its share in the responsibility of recovery.

From a manufacturer of grey iron castings and mine machinery.

Miscellaneous

Difficulty in getting reasonably prompt delivery on our raw materials. This applies particularly to the steel mills.

From a manufacturer of snow plows for motor trucks.

* * *

In the malleable industry, a lack of demand. In the forged tool industry, urgent, excessive demands.

From a manufacturer of forged hand tools.

* * *

Volume is too small to be profitable. Our own business has increased from about 25 per cent of profitable volume to 50 per cent.

From a manufacturer of high pressure and special valves and specialties.

Attempts at price fixing through codes.

From a manufacturer of machine products.

* * *

The need for continued contact of people in the same line of industry and continued study from their trade point of view of merchandising principles and practices, fair costs of production and sales figures.

From a manufacturer of spring washers, window equipment for railway cars and buses, etc.

* * *

1. Uncertainty of government actions. 2. Gross extrav-

(Continued on Page 170)

BENITO MUSSOLINI
Master Planner

Labor Under the NRA—

By G. L. LACHER
Managing Editor, THE IRON AGE

WHEN President Roosevelt launched the national industrial recovery program he had the enthusiastic support of the entire nation. Deflationary forces had so demoralized competition that Governmental intervention was regarded as imperative. Price chiseling and wage slashing had gathered such momentum in certain industries that they could not be halted save with the power of Federal authority. A real emergency existed and the President was applauded when he took action to cope with it.

Industrial companies, which were powerless individually to check destructive competitive practices, were only too glad to abide by higher standards as soon as they became obligatory for all. In fact, there was no serious opposition in any industry to the Government-sponsored program of raising minimum wage rates and shortening working hours. And there was general satisfaction on the part of all with the final abolition of child labor.

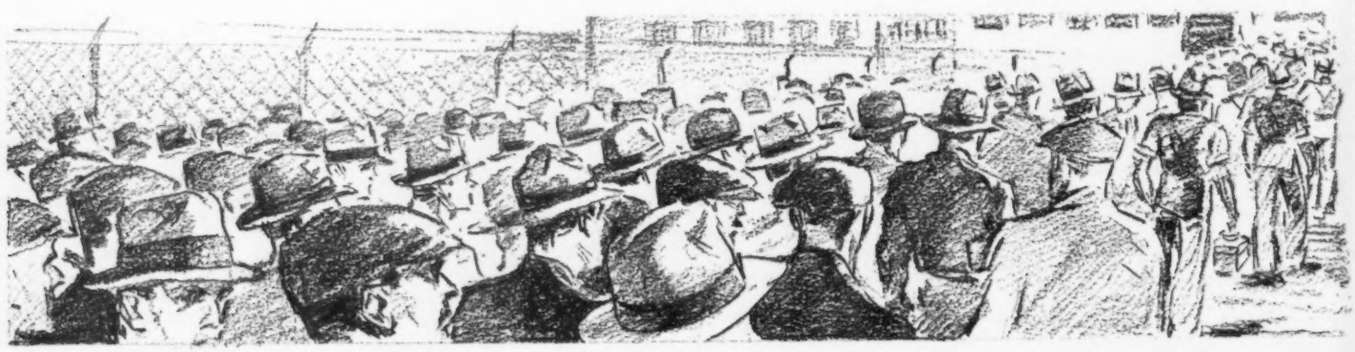
Epidemic of Strikes

So far, so good. Industry underwent a marked revival. All elements in the nation seemed to be collaborating toward a single end. And then something happened. Industrial strife, which had been at a minimum throughout the depression, became the order of the day. Strike after strike was called. The loss in man-days from industrial disputes rose from 504,362 in June to 1,404,850 in July, 1,730,634 in August, and 3,826,835 in September, according to Department of Labor findings. And the strange part of it all was that these strikes, as a rule, were not over wages or working hours, since those conditions were settled by the blanket code (the President's Reemployment Agreement) or by individual industrial codes. Almost invariably strikes were called for the purpose of enforcing unionization on open-shop industries.

The National Industrial Recovery Act had hardly been passed before leaders of organized labor seized upon Section 7a as a national charter for the closed shop. Although the clause in question is merely permissive, specifying that employees have "the *right* to organize and bargain collectively through representatives of their own choosing," union leaders interpreted it as mandatory. Throughout the country they sought out the individual workingman and told him that it was his duty, under the law, to join a union. Government officials have tried repeatedly to nullify this misrepresentation by explaining the exact purport of the act. General Johnson, for example, made it plain that organization is not compulsory, in his address on labor at Chicago, Sept. 4. He stated explicitly that there is nothing in the law to prevent workers from dealing with employers individually if they choose to do so.

A. F. of L. Grows

But these official explanations have been to no avail. The ferment introduced into the laboring masses has continued to work. And union organizations have made great gains in membership. In a few months the American Federation of Labor has recovered all the ground lost in the past 14 years, its membership now slightly exceeding the war-time maximum, being more than 4,000,000. Moreover, it has succeeded in unionizing the bituminous coal industry, even extending its influence to steel company properties. The latter, called "captive mines" because they are operated purely as an adjunct of the steel industry and do not produce coal for the general market, have always been considered as distinct from the coal industry proper. Yet they were made the special object of attack by the United Mine Workers, possibly because it was thought that union penetration of captive mines might



New Deal or New Illusion?

WILLIAM GREEN
Advocate of New Deal

serve as an entering wedge for unionization of other branches of the steel industry. At any rate union leaders were not satisfied with the offer of the steel companies to introduce the same wages and working conditions in captive mines that obtained in commercial mines. They insisted that elections be held in all steel company mines to determine the choice of representatives for collective bargaining. After protracted disturbances marked by outbreaks of violence, such elections were ultimately held under the direction of the National Labor Board, and in a majority of cases the employee representatives chosen were union officers.

The Weirton Case

In its campaign to organize the steel mills themselves the American Federation of Labor has concentrated its attack on the Weirton Steel Co. In September it succeeded in starting a strike at this company's plants and thereby insured the intervention of the National Labor Board.

The board finally arranged for an election of employee representatives under its auspices. However, it specified conditions governing the election which represented a radical departure from rules fixed by the by-laws of the Weirton employee representation plan. Among other things, the board prescribed a method of nomination by petition, which was denounced by E. T. Weir, chairman of the Weirton company, as "inherently vicious and unfair." "Our employees' organization's by-laws require nomination by secret ballot," he said, "and this is the only fair method. If nominations are by petition the persons who sign the petition are subjected to criticism, threats and intimidation. . . . Notwithstanding defeat at the primaries, defeated candidates could have their names placed on the ballot by obtaining only 10 signatures. This would nullify the primary election and completely destroy every element of free choice by secret ballot in nominations, which is one of the fundamentals of the plan adopted by our employees."

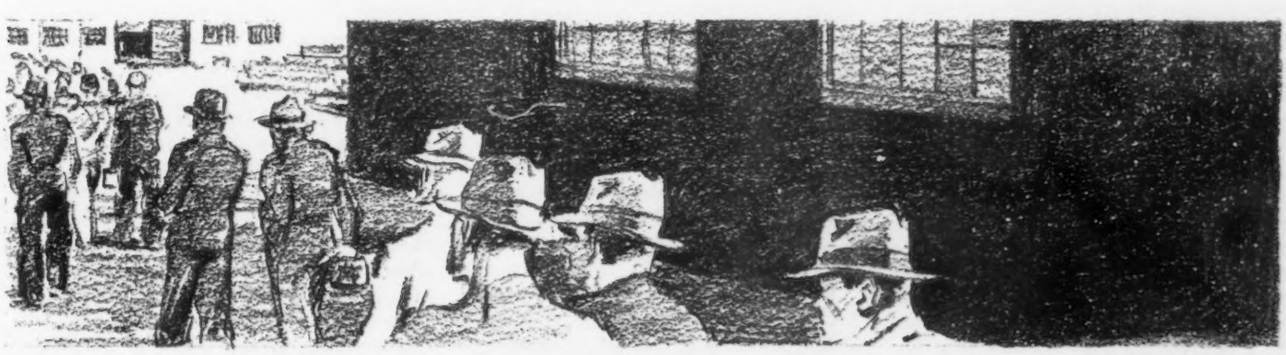
The primary and the election at the Weirton plant were, therefore, held according to the rules of the employees' organization in defiance of the Labor Board's instructions. It is not yet clear what action will be taken in the case by the board, but at any rate it should be a real test of its authority, and particularly its right to dictate the conditions under which labor may choose its representatives. In other instances, notably in the case of the Art Metal Construction Co., Jamestown, N. Y., decisions of the board have been ignored, but the Weirton case is the first which has commanded nation-wide attention and should result in a real showdown, if the new labor tribunal wishes to save its face.

The National Labor Board Evolves

The National Labor Board was created to "pass promptly on any case of hardship or dispute that may arise from interpretation or application of the President's Reemployment Agreement." In this spirit the board, in its initial stages, confined its efforts to conciliation. Parties to a dispute were not compelled to appear before it and decisions were to be binding only if the opposing sides agreed in advance to be bound by them. But this interpretation of the board's powers has changed. Whereas, in September, its chairman, Senator Robert F. Wagner, declared that the board "cannot issue summonses and it will not swing a club," late in October he stated that "to make its policies effective, the National Labor Board is backed by all the powers and penalties of the National Recovery Act, which will be used when necessary."

To further clarify the authority of the board President Roosevelt issued an order on Dec. 19, specifying that the tribunal "settle by mediation, conciliation or arbitration all controversies between employers and employees which tend to impede the purposes of the National Industrial Recovery Act." He also stated that "all action heretofore taken by this board in the discharge of its functions is hereby approved and ratified."

Commenting on the order, Philip R. Van Duyne, attorney and president,



Meeker Foundry Co., Newark, N. J., who has given the recovery act careful study both from the legal and practical viewpoints, says:

"It seems to me that the recent order of the President not only constitutes retroactive 'legislation' attempting to validate acts of unlawful regional labor boards, but also that it distinctly broadens the powers of the National Labor Board. I think this is done by the use of the word 'mediation' in addition to the words 'conciliation or arbitration.' 'To settle by mediation' seems to infer an intervention by an authority empowered to intervene and settle a dispute. If the National Labor Board adopts this construction, and judging by its past history it is certainly likely to do so, its decisions will, in great numbers of cases, result in this Governmental agency making contracts between employer and employee, in each instance interfering with both the liberty of contract and the present legal construction of the phrase 'collective bargaining'."

Even though, as Mr. Van Duyne points out, the introduction of the word "mediation" carries a suggestion of the power of compulsion, the President's order does not explicitly invest the board with authority to issue summonses or to force acceptance of its decisions when intervention has not been requested.

Distinction Between Labor Board and Compliance Organizations

The National Labor Board was established by executive order on Aug. 5. It was supplemented by 17 regional boards in October and November. Each board has an impartial chairman and an equal number of labor and employer representatives. In addition, the national body has an executive staff to assist in mediating or conciliating labor disagreements. The national and regional boards, according to the *American Federationist*, are charged with handling all cases where a strike or lockout is threatened or in effect, or where employees are denied the right to organize or where organized workers are prevented from bargaining collectively with their employers.

The Labor Board organization does not concern itself with questions arising out of labor provisions already in effect in the President's blanket code or in individual industrial codes. If an employer is charged with noncompliance with a code labor provision, the case comes before a local compliance board (if no special compliance agencies have been set up in individual codes) and, in the absence of a settlement, goes successively to the district compliance director and the National Compliance Board.

SENATOR ROBERT F. WAGNER
Chief Justice of Labor's Supreme Court

The district compliance directors, numbering 26, are to be replaced under the new National Emergency Council, by 48 State compliance directors. An adjustment board, consisting of a representative of the public interest, a representative of industry and a representative of labor, will work with the director in each State. The directors may appoint field representatives in communities where a large number of unadjusted complaints arise. Besides, local adjustment boards may be set up where acceptable to labor and industry.

Complaints of code violations will go originally to the State director or his designated agent where no authorized code agency has been set up to handle such matters. If the director or his agent fails to adjust a complaint, the case may go before the State adjustment board. If the State board fails to effect an adjustment, the complaint will be forwarded to the NRA at Washington, which in turn will pass it on to the central code authority for the appropriate industry for such action as it may be able to take. If the code authority is not yet organized or functioning, the complaint will be referred to the deputy administrator for the code in question. In case the code authority or the deputy or divisional administrator is unable to effect an adjustment, the complaint will be referred to the National Compliance Board. In its discretion this board may refer the case either to the Attorney General or the Federal Trade Commission.

Penalties Under the Act

Under paragraph (f) of Section 3 of the Recovery Act any violation of the law is a misdemeanor carrying a penalty of $500 for each offense for each day of violation. Under paragraph (c) the Federal courts are authorized to prevent and restrain violations. In addition, the Federal Trade Commission may issue a cease and desist order which is enforceable through the courts.

Presumably proof of interference with the right of employees to organize collectively would expose an employer to prosecution. But whether a refusal to accept a decision of the Labor Board would be construed as such interference is another question. Section 7a gives employees the right to bargain collectively but does not require that such bargaining result in any agreements. Section 7c authorizes the President to fix maximum hours of labor, minimum rates of pay and other conditions of employment, but it is clear from the text that these powers are to be used only in the case of a failure to establish standards for entire industries or trades. The clause obviously does not cover local disputes.

What Is There to Bargain About?

And this raises the question as to what there is really left to bargain about, in view of the fact that maximum hours of labor and minimum rates of pay for each industry and trade are fixed at Washington when codes are adopted. We find an answer in the December *American Federationist*:

Question: Do the codes of fair competition fix all matters with respect to hours and wages by law? **Answer:** No, they set **maximum** hours and **minimum** wages and then leave the rest to later adjustment. Collective bargaining is the standard way to make this later adjustment.

In this interpretation the A. F. of L. holds out the hope to workers that by collective action in individual plants they can obtain more favorable hours and wages than prevail in the industry as a whole.

Let us analyze this reasoning. The main purpose of the Industrial Recovery Act was to eliminate unfair competitive practices. It was for that reason that all employers in given industries have been required to observe certain wage minima and hour maxima. Let us assume that a union succeeded in forcing an individual plant to establish minimum wages and maximum hours more favorable to labor than existing code standards, or to boost the wage rates of skilled classes of labor. What then? Wouldn't that plant be placed at a serious disadvantage in relation to the rest of the industry? Wouldn't it be subjected to unfair competition within the meaning of the law?

It is hard to conceive how the national administration would permit such maladjustments to be created at a time when it is making a country-wide effort to bring all economic factors into better balance. But more on this subject later.

The Employer's Immediate Problem

Few observers have pursued the implications of the Recovery Act to their logical, ultimate conclusions. Meanwhile the prevailing conceptions of the public at large, whether erroneous or not, must be considered. The average American prides himself on his sense of fair play and he cannot see why labor should not be permitted to organize for collective bargaining if industries are allowed to cooperate to curb unfair competition. To him what is sauce for the goose should be sauce for the gander. He does not bother to inquire whether, under the law, organization for collective bargaining is mandatory or not. He assumes that it is and that any employer not in sympathy with such action is either unfair or hopelessly behind the times.

It is this sort of sentiment that employers have to deal with. Those who are astute are aware that public opinion is more powerful than law and have therefore wisely adapted their courses to the changed conditions confronting them. Many employers have adopted employee representation plans, if they did not already possess them. Such plans are particularly suited to large organizations where management lacks the intimate contact with employees that exists in small plants. A representation scheme in an organization of a few hundred employees, on the other hand, seems superfluous in view of the already close informal contacts between management and men that prevail in such a company. But, unnecessary or not, employee organization seems to be the order of the day —for the time being at least.

A Mysterious Coincidence

An employer who does not recognize this fact is courting trouble. An illustration or two from actual experience will indicate what can happen. In a Central Western plant employing 400 men a minor dispute arose which reached the attention of a regional labor board. A representative of the board called at the factory office and asked the management whether it dealt with its employees collectively. The company was forced to give a negative answer and, lo, within 24 hours union organizers appeared on the scene and succeeded in signing up some 40 workmen. This

E. T. WEIR
Who Bore Brunt of Labor's Attack

accomplished, the labor board representative was duly advised, whereupon he waited on the plant manager and informed him that his employees were now organized for collective bargaining.

In another case the head of a small company which had consistently paid better than union wage scales was suddenly advised that his plant had been unionized. "That's news to me," he replied, "but if it is true I shall be only too glad to reduce wages to the union rates."

Act Does Not Ban Representation Plans

Some employers are under the misapprehension that the Recovery Act prohibits them from making any move toward the organization of employee representation plans. Union leaders, of course, have helped to promote this idea. In a recent public statement William Green, president of the American Federation of Labor, had the following to say on this subject:

"The management of a company cannot set up a company union for the workers without in some way, by suggestion or by innuendo, requiring the employees, the timid employees at least, working for that company to become members of the company union set-up. There is coercion from the beginning to the end."

Mr. Green's opinion is not shared by the courts. The question of coercion was brought up in the case of the Texas & New Orleans Railroad vs. the Brotherhood of Railway and Steamship Clerks in which it was charged that the carrier had violated Section 2 of the Railroad Labor Act of 1926, which is very similar in wording to Section 7a of the Recovery Act. Whereas the latter provides that organization for collective action shall be free from the *interference, restraint* or *coercion* of the employers the Railroad Labor Act specifies that there shall be no *interference, influence* or *coercion.*

In deciding the case, Supreme Court Justice Hughes made it plain that the prohibition in the railroad act in no way prevented "the normal relations and innocent communications which are part of all friendly intercourse, albeit between employer and employee." Guilt on the part of the employer, in his opinion, could be established only when there was an effort to corrupt or override the will of employees. "It is no more difficult to appraise conduct of this sort in connection with the selection of representatives for the purposes of this act," he declared, "than in relation to well-known applications of the law with respect to fraud, duress and undue influence."

Marked Increase in Representation Plans

Having this decision in mind, many employers have initiated the organization of employee representation plans. And they have been unusually successful. A survey in December by the National Industrial Conference Board, covering 3314 manufacturing and mining concerns employing 2,585,740 wage earners (about one-fourth the total number employed in those industries), showed that 45 per cent of the workers deal with their employers through plans of employee representation, 45.7 per cent deal with them individually, and 9.3 per cent do so through organized labor unions. The number of employee organizations has increased substantially since the passage of the Recovery Act. Of plans reported to the Conference Board, 61.3 per cent of the employee representation plans and 41.8 per cent of the labor union agreements have been adopted since June 16, 1933, when the law went into effect. The wide use of employee representation indicated by the Conference Board survey does not conflict with the claims of greatly increased union membership. An employee may be a union member without dealing with his employer through a union.

What Is Recognition?

Of course, one thing that the recovery act makes mandatory is that employers receive anyone representing a group of his employees. Even where a labor union has only a minority membership in a plant it can demand an audience with the management. In the case of one company not necessarily typical, 400 out of 900 employees are represented by a trade

union, 350 by an employee representation plan, and 150 have failed to select any plan of collective bargaining.

There is nothing in the law stipulating that employees forming an organization must constitute a majority of a plant's workers to exercise the right of collective bargaining. Yet in its decision in the Edward G. Budd Mfg. Co. case on Dec. 14, the National Labor Board held that recognition of a union is necessary only when the organization represents a majority of the employees. Just what recognition means is not explained. In precode days a mere willingness on the part of an employer to give an audience to union representatives was frequently regarded as recognition. At present, recognition is increasingly interpreted as the signing of a contract with a union—something that is not mandatory under the Recovery Act. As pointed out before, the employer satisfies all the requirements of the law if he deals with employees collectively. He is not forced to come to an agreement with them.

Closed Shop Is Illegal

And any agreement that might be made could not legally impose a closed shop on an industry. But labor is not worrying about the theoretical rights of employees who may elect to deal individually with employers. On this point General Johnson made the labor view clear in his address in Philadelphia on Dec. 2. Conceding that Section 7a made it impossible for an employer to make membership in a union a condition of employment, he added, "I do not regard this phase of the act very important because, as a practical matter, after a collective bargain with a union, I would say that individual bargaining is not very practicable."

In other words, the cue of organized labor is to get a preponderance of union men in a plant and forget about the small minority.

There is no doubt that unionization of industry is regarded by many members of the Administration as necessary and desirable. In fact, some observers charge that the National Recovery Administration is acting largely in the interests of union labor and has discovered that Section 7a is not effecting its purposes. While the clause authorizes collective bargaining, it does not stipulate that bargaining result in a contract. Hence, so long as bargaining takes place, there is no breach of the act. It is believed in some quarters that the principal aim of the recent Presidential order is to see to it that collective bargaining results in agreements, even if at the dictation of the National Labor Board or its regional subsidiary boards. If the executive order fails to achieve this purpose, it is anticipated that legislation will be introduced by Senator Wagner to bring about the desired result. Enforced contracts, if held constitutional, would, of course, take away all semblance of individual control of the owners of industry over their private property rights.

Labor Has No Responsibilities

It is interesting to observe that thus far employers have made all the sacrifices in industrial relations since the Recovery Act was enacted. There is much talk about how management can be forced to do this or that, under the

Some Members of Labor Committee,

FRANK PURNELL
President, Youngstown Sheet & Tube Co., Youngstown, Chairman

C. R. HOOK
President, American Rolling Mill Co., Middletown, Ohio

R. J. WYSOR
Vice-president, Republic Steel Corpn., Youngstown

F. E. FIEGER
General Manager, Jones & Laughlin Steel Corpn., Pittsburgh

J. C. WILLIAMS
President, Weirton Steel Co., Weirton, W. Va.

JOSEPH M. LARKIN
Assistant to President, Bethlehem Steel Co., Bethlehem

law, but nary a mention of labor's responsibilities. Let us suppose that a company makes a contract with a union. Would the Government have any means of punishing labor if it broke that contract? No penalties are provided in the Recovery Act.

Throughout the whole recovery program labor has been most naive, on the surface at least, in its interpretation of its opportunities. All that is necessary, according to its representations, to improve the status of labor is to shorten hours and raise wage rates. There is apparently no realization of the fact that higher cost of manufacture means higher prices which, in turn, may mean curtailment of demand. In other words, if the union formula results in less demand, that means less work to divide up. Hence shorter hours may result in still shorter hours until in the end there are no hours at all. In this connection it is significant that a survey prepared for this issue by THE IRON AGE discloses that advances in the prices of manufactured products have not offset increases in costs resulting from the observance of code wages and hours.

Business Mortality Is High

Business is a tender plant at best. It cannot be pruned excessively without withering and perishing. The conspicuous success of relatively few large enterprises has blinded us to the less fortunate lot of the average undertaking. Business mortality is high even in prosperous years. Commercial failures in the years 1927 to 1929 averaged 1.06 per cent annually, according to a study published by the National Industrial Conference Board. But this record does not tell the whole story, since it covers only those failures in which both owners and creditors suffer losses. The true record of business mortality includes all enterprises which pass out of existence. Such business deaths may be due to the outmoding of products, shifts in public taste, changes in managerial personnel and other variable factors in an ever-fluid commercial world. In some instances owners of businesses or members of partnerships die, causing the affairs of the enterprises to be wound up. Other businesses are discontinued for a great variety of reasons, but usually because they are unsuccessful. In our last good business year — 1929 — total discontinuances reached the high ratio of 19 per cent, according to R. G. Dun & Co. In the course of the 12 months 458,952 out of 2,422,574 business organizations passed out of existence. Studies for earlier years have disclosed similar ratios. To put it simply—one out of five businesses existing at the beginning of a year gives up the ghost before Dec. 31.

The Crux of the Unemployment Problem

Is it any wonder that capital is timid? With labor all "het" up and ready to do things—for its own advantage—investors are afraid to put their money into enterprises. They not only despair of making a profit but they fear the impairment or loss of their capital in case they tie it up.

Without doubt this one factor is the greatest barrier to business recovery. Col. Leonard P. Ayres, well known statistician, has disclosed that there is relatively little unemployment in consumer goods industries. Our greatest idleness is among capital

(Continued on Page 167)

American Iron and Steel Institute

W. A. MAXWELL, JR.
Vice-president, Colorado Fuel & Iron Co., Denver, Colo.

L. E. GEOHEGAN
Vice-president, Gulf States Steel Co., Birmingham

W. B. GILLIES
Vice-president, Youngstown Sheet & Tube Co., Youngstown

C. W. BENNETT
President, American Sheet & Tin Plate Co., Pittsburgh

RALPH WATSON
Vice-president, United States Steel Corpn., New York

WILFRED SYKES
Vice-president, Inland Steel Co., Chicago

▲ ▲ ▲ Poor Richard's

A Chronological Record of Recovery

March 4 . . .

F. D. ROOSEVELT inaugurated as President. The New Deal is launched.

March 5 . . .

PRESIDENT declares national banking holiday to protect banks against further withdrawals and to suspend gold exports.

March 9-June 16 . .

SPECIAL session of Congress. Rapid-fire and sweeping legislation enacted under the whip of the third and dynamic Democratic Chief Executive since the Civil War. Legislation penetrates every field of agriculture, business, industry and finance. Some of it admittedly experimental with termination period of two years. President's supporters declare it looks 50 years ahead. Opponents say it is rank state socialism.

April 6 . . .

BLACK 30-hr.-week bill, sponsored by Democratic Senator of that name from Alabama, passes Senate. Similar Connery Bill (Democrat, Massachusetts) reported two days earlier to House by Committee on Labor.

April 25 . . .

HEARINGS on Connery bill begin. Steel and many other industrialists oppose it. Supporting its principle organized labor, as represented by A. F. of L., opposes proposal to fix minimum wages on its traditional view that these will become maximum wages.

May 4 . . .

PRESIDENT Robert P. Lamont of American Iron and Steel Institute testifies before House Committee on Labor and suggests a Government board or council to be appointed by the President and working through industry as then organized. Plan somewhat similar to one previously offered by Secretary of Commerce Daniel C. Roper before Chamber of Commerce of United States for Economic and Planning Council of 21 industrial leaders to cooperate with Government.

May 5 . . .

ENLARGEMENT of Black-Connery proposal also to provide for minimum wage standards proposed by Secretary of Labor Frances Perkins is drafted and additionally carries virtual embargo against imports not produced under conditions similar to those prescribed in bill.

May 17 . . .

BROADENING plan of industrial control, President recommends $3,300,000,000 program of State, local and Federal public work and "machinery necessary for a great cooperative movement throughout all industry in order to obtain wide reemployment, to shorten the working week, to pay a decent wage for the shorter work week and to prevent unfair competition and disastrous over-production." These measures were the genesis of the Industrial Control-Public Works bills, now fathered by the NRA and the PWA.

May 20 . . .

INDUSTRIAL Control-Public Works bill introduced by Senator Wagner, Democrat of New York. Aid in framing measure given by prominent men from industry, organized labor leaders and administration officials. Though opposed by industrialists generally, measure carries the collective bargaining section and also the licensing provision. Provides for termination June 16, 1935, except that unless Congress extends it, licensing provision ends June 16, 1934.

May 26 . . .

FOLLOWING hearings before Ways and Means Committee Industrial control bill passes House, 324 to 76. Hearings before Ways and Means Committee because of tax provisions to raise funds for public works appropriation.

May 27-June 2 . . .

STEEL producing and fabricating representatives join others in attack before Senate Committee on Finance against labor provisions of Industrial Control bill. Urge open shop declaration. President Robert L. Lund of National Association of Manufacturers attacks licensing provision as being unconstitutional.

Becomes clear that General Hugh S. Johnson has been selected as Administrator of the National Recovery section of the law when he appears before meeting of coal operators. He says success or failure of the law probably will be determined within six weeks and depends on whether great industries will offer their help and go along with the Administration.

June 6 . . .

NATIONAL trade associations begin to organize actively in preparation for operation under NRA. (Formerly known as NIRA but eye is knocked out because Nira sounded too sissy and word hatched too many very poor wisecracks.)

June 6-13 . . .

GENERAL JOHNSON, without waiting for passage of law, sets up huge organization in Department of Commerce building and gets

Almanac *(With Apologies to Benjamin Franklin)*

Legislation and Administration

all set for its operation. The General announces NRA will be operated as nearly as possible through voluntary action of industry and asks for and receives pledges from seven basic industries, including steel, oil, coal, textile, automotive and two others not named, altogether representing 70 per cent of industrial employment. Some prominent men from industry selected and organization moves fast, with Deputy Administrators named to serve as "industrial adepts." Preparation of codes begun.

June 15 . . .

GENERAL JOHNSON announces his purpose to have wage increases come first and price advances deferred.

NRA turns definitely to open price associations, heretofore frowned upon, but given much wider latitude along with industry because of greater immunity under anti-trust laws.

General Johnson says close check will be kept on the "chiseler."

June 16 . . .

PRESIDENT ROOSEVELT signs National Recovery bill. In message President expresses hope that 10 basic industries which control the bulk of employment can submit simple basic codes at once and "that the country can look forward to the month of July as the beginning of our great national movement back to work." The President also emphasizes the necessity of raising wages first, to be followed by higher prices.

June 20 . . .

GENERAL JOHNSON says the American Iron and Steel Institute is working as hard as it can on its code.

Also says that something in the nature of an armistice over building new capacity will be asked of industries. Likewise, he says industries will be asked to raise wages first and prices last.

June 22 . . .

IN first NRA bulletin, General Johnson asks for immediate submission of simple basic codes by the 10 largest industries. Does not designate the latter. Bulletin points out it is not the function of the Administration to prescribe what shall be in codes or to compel organization of either industry or labor.

June 24 . . .

FIRST meeting of Labor Advisory Board. President John L. Lewis makes vigorous complaint against General Johnson's statement that conditions of employment, if found satisfactory, are subject to approval although they may not have been arrived at by collective bargaining. Asks that labor be consulted before codes are presented. Miss Perkins presides over Board meeting and says newly formed company unions "hastily thought up since the NRA was proposed will not be regarded as truly representative."

Donald R. Richberg, NRA general counsel, arouses resentment of business and industry in address before New York Merchants' Association. After stating NRA does not deprive merchants of their constitutional rights, Mr. Richberg said that, "If this adventure should fail, it will not be a failure of Government — it will be a failure of an industrial system which the NRA seeks to improve in order that its value may be preserved. It will mean either that the system is fundamentally unsound or that the present managers of private industry are incapable of operating it successfully." It was declared to be industry's "last stand."

June 25 . . .

"IF we get too far ahead of our purchasing power it will mean a new collapse," General Johnson says at press conference. "I shudder to think what would happen if we have another."

June 27 . . .

COVERING the cotton textile industry, Abou ben Adhem of codes, first hearing starts. W. L. Allen, former chairman of Sheffield Steel Corpn., and former director of American Rolling Mill Co., presides as Deputy Administrator. Initial source of complaint arises over labor provisions. Organized labor complains of their interpretation by General Johnson. Industrialists complain that provisions are being used by organized labor to unionize industry throughout the country.

July 4-11 . . .

SO called delay of basic industries in submitting codes causes NRA concern. General Johnson warns of growing spread between production and purchasing power curves and makes grave forecast unless latter is built up soon. Frowns upon reports that Administration may use drastic powers to compel early submission of codes.

July (first week) . .

TENSION between organized labor and open shop advocates tightens. General Johnson, noting literature coming from opposing sides, says statements that it is necessary for labor to belong to company unions and to organized labor, are erroneous. NRA Administrator says it is his duty to see that all labor, organized as well unorganized, gets a square deal.

July 15 . . .

AMERICAN IRON AND STEEL INSTITUTE submits code for steel industry. Carries open shop declaration.

July 23 . . .

GENERAL JOHNSON predicts air soon will be full of "dead cats."

July 25 . . .

GENERAL JOHNSON inaugurates the President's Reemployment Administration. Hail the Blue Eagle!

July 31 . . .

STEEL code hearing before crowded auditorium in Department of Commerce building. Code presented by Robert P. Lamont as president of American Iron and Steel Institute, in tense atmosphere with all the trimmings of a drama. Dramatis personae include such prominent figures as General Johnson, Deputy Administrator K. M. Simpson, General Counsel Richberg, directors of Institute, organized labor leaders, and Madam Secretary of Labor Perkins. Reading the code, Mr. Lamont proceeds to open shop declaration. General Johnson interrupts and expresses view the declaration is "inappropriate and of questionable legality," with similar sentiments coming from Mr. Richberg. Drawing a prepared statement from his inside pocket, Mr. Lamont said he anticipated such a view, and that he believed the declaration can be omitted from code without materially altering it, and would recommend withdrawal to directors. Hearing halted while directors hold brief conference. Mr. Lamont returns to platform and announces directors agreed to withdrawal of declaration. Loud cheers from organized labor led by President Green, A. F. of L., and congratulations to Institute from Miss Perkins. Green asked for 6-hr. day, 30-hr. week and that steel industry be policed by Advisory Council on Industrial Relations of seven members, three each from Institute and Federation of Labor, and chairman appointed by President. Miss Perkins critizes numerous features of code, especially as to hours, wages and basing point system.

Aug. 1-3 . . .

BOARD of Directors of Institute, in first formal meeting ever held in Washington, confers at Mayflower hotel over points raised by Mr. Richberg and labor interests regarding code. Richberg asked particularly about plan to control production, prices, consumer protection and basing price system.

Aug. 6 . . .

IN a report to General Johnson, Mr. Lamont says the steel industry can go no further than code provisions as to hours of work, wages, etc. Upholds basing point system. On consumer protection says the definitions of code provisions "constitute the greatest safeguards."

Aug. 15 . . .

COMMITTEE of American Iron and Steel Institute, called to Washington by General Johnson, go into lively conference with him, Deputy Simpson, Mr. Richberg and Miss Perkins at latter's office, to wipe out differences over code, especially as to hours and wages. President Green of American Federation of Labor walks into conference. Steel executives walked into adjoining room. Stir created. Miss Perkins attempts to compose situation, but in vain. Mr. Green says he was present as labor adviser on code. At press conference General Johnson says that Miss Perkins was labor adviser and had toured some steel district in that capacity. Later develops that Mr. Green had been chosen as labor adviser on steel code. Steel men making up committee are: President W. A. Irvin, United States Steel Corpn.; President Eugene G. Grace, Bethlehem Steel Corpn.; President L. E. Block, Inland Steel Co.; President Thomas Girdler, Republic Steel Corpn.; Chairman Weir, National Steel Corpn.; President Hugh Morrow, Sloss-Sheffield Steel Co.; Mr. Lamont; W. J. Filbert, comptroller, United States Steel Corpn., and H. A. Moore, counsel, American Iron and Steel Institute.

Aug. 16 . . .

CHAIRMAN Myron C. Taylor, United States Steel Corpn., and Chairman C. M. Schwab, Bethlehem Steel Corpn., confer at White House with President Roosevelt. Reported to have discussed differences over code, with President interceding to smooth out.

Aug. 16-18 . . .

STEEL executives, NRA officials and Miss Perkins continue conferences, shuttled back and forth at Miss Perkins' and General Johnson's offices, during long hours, far into the night, sweltering and nerve-worn. Rushing from conference at his office. General Johnson, hair touseled, tired-looking, speaks of steel executives as "wildcats."

Aug. 19 . . .

PRESIDENT approves steel code. Differs but slightly from code as finally submitted at hearing.

Aug. 23 . . .

GENERAL JOHNSON officially orders words "open shop" and "closed shop" from all codes. Says collective bargaining section of act cannot be changed by interpretation by any one and is function of administration and courts to interpret the law.

Aug. 26 . . .

AUTOMOBILE code approved by President. Contains "merit clause." General Johnson says he let it "get by" in an "unguarded moment."

Aug. 29 . . .

STEEL code becomes effective.

Aug. 31 . . .

"DEAD CATS" begin to fly. Dudley S. Cates, Assistant Recovery Administrator, resigns following open break with General Johnson over labor policy. Mr. Cates insisted on "vertical union" plan. General Johnson expressed agreement that "with an industry organized vertically, the local labor organization is vertical also." Administrator, however, points out that NRA guarantees employees right to collective bargaining and that he takes this to mean no "theoretical administration choosing." Mr. Green says Mr. Cates is advocate of company unions. Break is forerunner of reorganization of NRA because of both internal dissension and completion of first phase of work. Preparatory to broader administration, personnel reduced somewhat and consolidated.

Sept. 1-9 . . .

ADMINISTRATION considers capital goods movement. White House statement issued saying consideration has been given to the matter of specific loans to the railroads for the purchase of steel rails, "provided the price of steel rails can be reduced."

General Johnson says he has given considerable thought to matter of equipment buying and replacing of obsolete euipment in connection with his "Buy Now" drive.

Sept. 18 . . .

PERMANENT administrative reorganization of NRA set-up, centering round Policy Board with plans to establish regional agencies of National Labor Board. Reorganization looks to merging of as many industries as practicable under as few basic codes as possible. Robert W. Lea made Assistant Administrator and Deputy Administration organized under four Divisional Deputies, consisting of Malcolm Muir, K. M. Simpson, A. D. Whiteside and General C. C. Williams.

Sept. 25 . . .

PRESIDENT ROOSEVELT has White House conference with steel executives regarding large scale purchase of rails through PWA loans. Steel executives asked to reduce price of rails. Those in the delegation were Chairman Taylor of the United States Steel Corpn., President Grace of the Bethlehem Steel Corpn. President Block of the Inland Steel Co., and Arthur Reeder, receiver for the Colorado Fuel & Iron Co. Aside from the President, other Government officials present were Mr. Eastman and Mr. Richberg.

Oct. 3-7 . . .

LABOR strikes begin to spread rapidly and cause alarm as threat to the NRA. Reflect one of first reactions from operation of codes, disputes developing over unionization. Trouble at steel owned captive mines in southwestern Pennsylvania despite previous agreement of steel executives with President Roosevelt looking to settlement. Minor strikes penetrate steel mills while automobile industry feels effects of strike of tool and die makers.

Oct. 6 . . .

MR. EASTMAN announces tentative commitment of railroads for purchase of 844,525 tons of rails and 245,221 tons of track work material. Makes it a condition of PWA loans that rail price shall not exceed $35 per ton.

Oct. 7 . . .

PRESIDENT ROOSEVELT and steel executives hold two long conferences at White House over captive mine strike situation. Said to have dealt principally with check-off, system urged by United Mine Workers and opposed by mine owners. White House issues statement that if mine owners fail to agree with workers after collective bargaining with representatives chosen by workers, President will make decisions based "on the principle that captive mines must operate under conditions of work substantially the same in the broadest sense as those which obtain in commercial mines." Steel men present included Mr. Taylor, Mr. Grace, Mr. Weir and Chairman George M. Laughlin of Jones & Laughlin Steel Corpn.

Oct. 12 . . .

THROUGH Counsel Miller, steel companies advise President Roosevelt of modified form of check-off at coal mines. Action taken with understanding it does not interpret or modify any existing statutory requirements or exercise of any administrative discretion.

Oct. 18 . . .

NATIONAL LABOR BOARD tells striking tool and die makers to return to work and negotiate settlements with individual employing automobile manufacturers.

Oct. 19 . . .

PRESIDENT ROOSEVELT clarifies Section 7 (a) of Recovery act in communication to General Johnson. Says that while there is nothing in the section to interfere with the bona fide exercise of the right of an employer to select, retain or advance employees on the basis of individual merit, the section does clearly prohibit the pretended exercise of this right by an employer simply as a device for compelling employees to refrain from exercising the rights of self-organization, designation of representatives and collective bargaining.

Oct. 24 . . .

SENATOR ROBERT F. WAGNER, chairman of National Labor Board, in radio broadcast, warns both labor and industry of danger of flouting Board decisions. Reminds industry of sanctions and licensing power in hands of Board.

Oct. 24-31 . . .

LABOR BOARD trying to negotiate settlement of coal mine strikes in Pennsylvania, Alabama and Kentucky; strike of members of Amalgamated Association of Iron, Steel and Tin Workers at plant of Weirton Steel Co., and strikes at assembly plants of Ford Motor Co. at Chester, Pa., and Newark, N. J., and a large number of other strikes.

Oct. 31 . . .

GROWING criticism of NRA resented by latter and verbal warfare of picturesque epithets flies back and forth, with General Johnson staunchly fighting back and foiling off the dead cats.

General Johnson challenges eligibility of Henry Ford to Government business when retail agent makes bid on trucks for CCC. (Controller General McCarl holds otherwise and after long and wordy chapters, Ford agent gets the business.)

Division Administrator Muir tells Associated Machine Tool Dealers that they need have no fears that their business will be impaired under operations of NRA by reason of any limitations imposed in codes.

Oct. 30 . . .

PRESIDENT ROOSEVELT at White House conference with rail makers splits the difference over their preferred rail price of $37.75 and Mr. Eastman's price of $35, making price of $36.375.

Another "agreement" at White House over captive mine strike situation when President Lewis of United Mine Workers accepts proposal that miners return to work preliminary to elections to be held under the auspices of the National Labor Board to determine representatives for collective bargaining purposes.

Nov. 1 . . .

MYRON C. TAYLOR of United States Steel Corpn., and Ralph E. Flanders, president, Jones & Lamson Machine Co., Springfield, Vt., named as members of Industrial Advisory Board of NRA to serve for four months.

Nov. 7-14 . . .

PWA allots $51,000,000 for purchase of rails and rail fastenings by railroads and $84,000,000 for Pennsylvania to be used in completing electrification between Washington and Wilmington, Del., purchase of cars, locomotives, etc. (Pennsylvania previously announced it would use its own funds in buying rails and fastenings.)

Frank C. Wright, vice-president, Bangor & Aroostock railroad, appointed chief of

Transportation Loan Division of PWA.

First formal application to I. C. C., for purchase of rails and fastenings made by Chicago, Milwaukee, St. Paul & Pacific, with view to buying 50,000 tons of rails and 19,000 tons of rail fastenings.

Nov. 16 . . .

SOVIET RUSSIA recognized by the United States.

Nov. 17 . . .

SENATOR CARTER GLASS of Virginia, old-line, Cleveland-type gold standard Democrat, bitterly opposed to number of Roosevelt's policies, expresses surprise that Russia would recognize the United States. Publisher of Lynchburg, Va., daily papers, which go beyond the PRA, Senator Glass scorns the Blue Eagle. But no attempt has been made to "crack down" on him. The phrase "crack down" originated with a corporation baiting newspaper correspondent at one of General Johnson's press conferences. The general, however, did say that unless he flew the Blue Eagle, the public would crack down on Mr. Ford. In reality, the controversy with Mr. Ford gave the latter more advertising than he probably could buy with his millions.

Nov. 21 . . .

UPON petition of American Iron and Steel Institute, President Roosevelt extends steel code to May 31, 1934. Institute report on code shows payrolls had increased $9,000,000 monthly with 92,000 employees added. While major benefits went to labor, according to the Institute, it expressed satisfaction with the code, and results obtained.

Nov. 22-23 . . .

ELECTIONS at steel owned captive mines to determine open or closed shop issue give United Mine Workers 9929 and independent brotherhoods 4045 of the votes cast, 20 mines going "organized labor" and nine going "company union," most of latter being Frick mines.

Dec. 5 . . .

PROHIBITION repeal effective.

Dec. 7 . . .

PRESIDENT transfers to NRA all codes under jurisdiction of Agricultural Adjustment Administration (AAA), except those relating to the first process of agricultural products. Action follows row within agriculture department between radicals, including some brain-trusters, and more conservative. Likewise gives more authority to NRA.

Dec. 9 . . .

LEADERS in motion picture industry compel removal of governmental dictatorial powers in code. Power had been given NRA to veto decisions of code authority and to change membership of the authority at will.

Dec. 11 . . .

ABOUT 100 dry cleaners and dyers hailed before Compliance Director W. H. Davis on charge of violating Blue Eagle price regulations. Smaller operators capitulate, but larger ones take defiant attitude and refuse to maintain prices which were sharply kited by the NRA, claiming higher levels had almost destroyed their business, the first example of a buyers strike under the code. NRA officials clearly recognized that case created a critical test.

Dec. 12 . . .

NATIONAL LABOR BOARD said any interference with the Board's supervised election at Weirton Steel Co. plants on Dec. 15 would cause obtaining of an injunction in Federal courts. Senator Wagner, chairman of Board, said yesterday he was determined to give the company's employees a fair chance to choose their own representatives for collective bargaining. Difference between company union and Amalgamated Association of Sheet, Tin and Iron Workers. President E. T. Weir in letter to Senator Wagner says he considered any agreement made with the Board for an election had been terminated, charging the Board had changed the form of organization.

National Coal Association petitions code authority of Petroleum Administrative Board to raise fuel oil prices so as to prevent unfair competition with bituminous coal. First formal demand by one industry that another modify its practices. Indicated this move might be forerunner of one industry seeking relief from alleged unfair practices of another industry.

Dec. 13 . . .

EDWARD R. STETTINIUS, JR., resigns from NRA Industrial Advisory Board to become vice-chairman of Finance Committee of United States Steel Corpn.

Dec. 14 . . .

SENATOR WAGNER refers Weirton Steel Co. case to Department of Justice.

Dec. 15 . . .

STEEL promises to be the first to test the validity of the labor provisions of the NRA in court. General Johnson announced that E. T. Weir, president of the Weirton Steel Co., in a telephone conversation from Pittsburgh, told General Johnson that it is time "to have this thing tested in court."

Dec. 19 . . .

PRESIDENT ROOSEVELT issues order giving National Labor Board "full legal power" as preliminary to court action in cases pending before Board.

Dec. 19 . . .

PRESIDENT announced organization of Electric Home and Farm Authority, capitalized at $1,000,000, to supply credit to farmers in Tennessee Valley for purchase of electrical equipment and appliances. First Government organization to provide credit directly to consumers.

Dec. 19 . . .

NATIONAL EMERGENCY COUNCIL extended to take over membership and work of Special Industrial Recovery Board.

Dec. 20 . . .

PRESIDENT extended to May 1, 1934, all provisions of President's Reemployment Agreement (Blue Eagle), declaring that displaying of NRA insignia would be evidence of acceptance.

Dec. 20 . . .

PUBLIC demand forces General Johnson to yield to dyers and cleaners who protested against high fixed prices set by NRA and rates are cut 20 per cent. Real and rare, it was a consumer's victory.

Dec. 20 . . .

SWEATSHOP hours at NRA, supposed cradle of shorter hours and decent wages, given whack in resolution of NRA Labor Advisory Board which recommends immediate cessation of overtime except in extraordinary cases.

Iron and Steel Industry Undertakes Self-Government

Four Months of Operation Under a Code of Fair Competition Have Emphasized the Need For Its Extension—Actual Benefits Can Now Be Realized

By T. H. GERKEN
News Editor, THE IRON AGE

WHEN the trial period of the code of fair competition of the iron and steel industry was extended from Nov. 17, 1933, to May 31, 1934, great was the jubilation in Washington and in the various centers of the industry. Congratulations were the order of the day. Everyone was very happy. The iron and steel industry had displayed its characteristic willingness to accept the hand dealt it from Washington, even though the exposed cards were not all honor tricks.

The nation's principal basic industry was apparently willing to add $6,500,000 a month to its wage bill in the face of sharply declining output, despite a loss of $150,000,000 in the preceding year and a probable large deficit in 1933. Such altruism surely deserved a pat on the back and the industry was ready to take its bow.

The steel industry was making a tremendous investment in social progress. What of the dividends? They did not appear on the immediate horizon, but no business can exist indefinitely without them. It is only logical to assume that the steel industry expects some return for its obvious financial sacrifices and that that return must unquestionably come from the improved competitive relationships arising from its code.

Code Extension No Surprise

Extension of the operation of the code was really no surprise to anyone. Even if the tremendous hullabaloo which would have arisen if the industry had chosen to dispense with its code be ignored, no choice was really offered. To revert to the ruthless competition of the old days in the face of increased costs and doubtful prospects of substantially increased volume would have been industrial suicide. Furthermore, the possibilities of self-government which the code offers would have had no adequate trial.

If the iron and steel industry is to profit by its investment in social progress, it must continue to operate under the provisions of its code of fair competition much longer than May 31. This fact is fully recognized by the leaders of the industry, and the progress made thus far in the administration of the code is of far more importance to the future of the business than to the immediate present.

WALTER S. TOWER
Executive Secretary, American Iron and Steel Institute

The Task of Administration

To the board of directors of the American Iron and Steel Institute, as the code authority for the industry, has fallen the tremendous task of administering the code. Having functioned previously in a strictly semi-official capacity, that organization was only partially prepared to undertake its new duties. However, real progress has been made. Since the code became operative on Aug. 29, 1933, the institute has had real executive authority, and through its board of directors, it has become the supreme arbiter of the destinies of the industry.

In signing the code, each of its members agreed that the said code constituted a valid and binding contract by and among all of the signers. The board of directors of the institute was given power by the code to interpret and construe its provisions and such provisions and interpretations are final and conclusive on all members of the code.

The method of administering the code is now fairly well known. Five committees were immediately appointed. The first, a general administrative committee, functions as an executive group on all administrative matters between meetings of the directors. The committee on labor has general supervision over policing the labor provisions of the code, reviews statistical reports relating to such provisions and observes compliance with those provisions by members of the industry. The duties of the statistical committee are apparent. The

traffic committee deals with trannsportation problems. The work of the committee on commercial matters has required the almost constant attention of the industry's leading sales executives since the code became effective.

For all practical purposes the commercial committee acts in an investigational and advisory capacity on sales procedure under the code. While its recommendations are naturally subject to the final approval of the directors of the institute, they are accepted in a majority of cases. Sales practice in the industry is synonymous with one object of the code, defined in its name as fair competition. It has thus fallen to the commercial committee to define fair competition, although in a general way, the definition may be found in the code. Schedule E specifically concerns prices and terms of payment. Basing points, maximum rates of discount for early payment and maximum periods of free credit are set forth in succeeding schedules. Finally in Schedule H are listed 13 unfair practices for which members of the code may be held accountable.

How Ruthless Competition Is Prevented

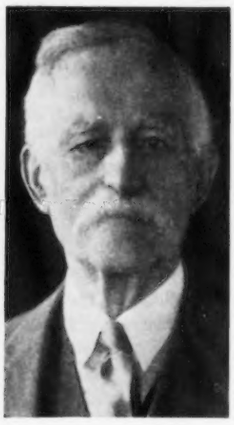
Perhaps the most important commercial feature of the code is the requirement that minimum base prices for all its products be filed by each member within 10 days after the effective date of the code. It is further provided that such a list of base prices must be kept on file at all times with the secretary of the institute and that reductions in such quotations cannot become effective until 10 days after they are filed. These price lists, at all times, are open to the inspection of all members of the code, as well as of other interested parties. Under the penalty of violation of the code, no member may quote a base price lower than that which he has on file with the secretary of the institute without giving 10 days' notice, during which time all of his competitors will likely have advised themselves of his intentions. In the case of an advance in base price, the competitor may use his discretion. However, it may readily be seen that if the price level reached a point at which buying was being hindered, the situation would be recognized by members of the code, who would either fail to meet the higher prices or even file reduced quotations, thus maintaining the price structure at a level which best served the interests of both consumer and producer.

This procedure can certainly not be construed as price fixing. On the other hand, the result is self-evident. If the seller is certain that his competitor is bound by contract to adhere to certain base prices which are the common knowledge of all other competitors; if he may not sell at a lower figure without giving his competitors 10 days' public notice of such intention, then price cutting in the commonly accepted sense of the term automatically ceases. The idea is possibly not new. It might have been just as effective in the past if any machinery had been provided by which members of an industry might have been able to bind themselves by contract. The National Industrial Recovery Administration has recognized that an industry cannot be called upon to make large financial sacrifices for the common good without being given an opportunity to improve its capabilities for making profit by cooperative effort.

Some Members of the Commercial Committee

S. E. HACKETT
Vice-President, Jones & Laughlin Steel Corpn., Pittsburgh, Chairman

F. B. HUFNAGEL
President, Crucible Steel Co. of America, New York



J. M. GILLESPIE
Vice-President, Lockhart Iron & Steel Co., Pittsburgh

PAUL MACKALL
Vice-President, Bethlehem Steel Co., Bethlehem, Pa.

C. L. WOOD
Vice-President, United States Steel Corpn., New York

W. W. HOLLOWAY
President, Wheeling Steel Corpn., Wheeling, W. Va.

E. L. PARKER
President, Columbia Steel & Shafting Co., Carnegie, Pa.

Original filing of base prices under the code required several days. In many cases, prevailing quotations were reaffirmed. Other prices, which had been below the cost of manufacture were advanced. Original filings by leading makers of all products were generally followed by other makers. Finished steel and pig iron quotations immediately achieved stability so far as new business was concerned. Existing contracts, of course, were not affected, and as many of them ran for the remainder of the year, steps were immediately taken to drive in full specifications against such contracts in time for shipment on or before Dec. 31. All tonnage not so specified was cancelled, and the industry entered the new year in a position to take full advantage of the commercial provisions of the code. In the first half of 1934, the benefits to be derived from the code should become fully apparent, and likewise, any defects will likely be brought to light. The period will be a crucial one for the industry.

How the Code Has Been Made Workable

In the meantime, steps have been taken to make the code more workable. In its original form, it was necessarily confined to rather broad general principles which could not possibly recognize certain trade practices of long standing regarded as desirable by both buyers and sellers. Also, procedure in some instances was left by the code to the directors of the institute for regulation. These matters constituted the first work of the commercial committee and resulted in a number of commercial regulations and resolutions which of course received the final approval of the directors.

It was immediately necessary to establish the status of jobbers under the code and make provision for allowing them certain deductions from the base prices of products intended for resale. This was accomplished by the first commercial regulation which defined the jobber and specified allowances to be made him. Jobbers' agreements were drawn up and the iron and steel distributing trade of the country has now been effectively organized. Not only is the jobber assured that his competitors are unable to buy steel from the mills at a lower price than he, but he also knows that they will be unable to sell at figures below those charged by the mills. Late in the year a similar regulation was approved which applies specifically to the jobbers of wire products.

Deductions to mail order houses and to consumers of galvanized sheets, galvanized wire and wire rods for further processing were also approved in another commercial regulation which likewise provided for the signing of agreements between the mills and consumers. In this regulation, the rights of small rolling mills and manufacturers, who must compete directly with steel making companies and their subsidiaries in the sale of certain products were recognized.

Commercial Resolutions Cover Wide Field

The 41 commercial resolutions approved by the institute in the first four months of the code's existence, cover a wide variety of special procedure, ranging from the establishing of arbitrary switching charges in large centers which are also basing points for finished steel products, to allowances to be made on sales of pig iron for indirect export. In the attached table, they are listed in chron-

of the American Iron and Steel Institute

J. J. KENNEDY
Vice-President, National Tube Co., Pittsburgh

JAY I. ANDREWS
Vice-President, American Sheet & Tin Plate Co., Pittsburgh

C. V. McKAIG
Vice-President, Carnegie Steel Co., Pittsburgh

D. A. MERRIMAN
Vice-President, American Steel & Wire Co., Chicago

B. F. FAIRLESS
Vice-President, Republic Steel Corpn., Youngstown

H. A. ROEMER
President, Sharon Steel Hoop Co., Sharon, Pa.

HAROLD HUGHES
Assistant to President, United States Steel Corpn., New York

ological order with their dates of approval by directors of the institute.

The resolutions have unquestionably done much to clarify commercial procedure under the code. In many cases, they merely recognize existing trade practices. In such recognition, many large buyers of steel saw an opportunity to seek the price concessions which they had formerly enjoyed. Thus far, their pressure has been ignored, although many in the steel industry believe that the buyers of 100,000 tons a year should enjoy some price advantage over the carload consumer. The chief difficulty in basing selling prices upon quantity would arise in determining the buyers to be favored, and dissatisfaction would undoubtedly be created among moderate-sized consumers. The granting of deductions in base prices of certain products sold for delivery in lower Michigan, made possible by commercial resolution No. 13, at first appeared to be a concession to large buyers in the automotive industry. Actually, it gives all consumers in that territory a part of the freight rate advantage they would enjoy if Detroit were a basing point on certain products made there or if delivered-by-water prices were permitted.

In a broader sense, the commercial resolutions have established basic principles for the future conduct of business which will be of inestimable value. Some of the resolutions have been criticized because of the obscurity of their meaning. Their legal phraseology is confusing to both buyers and sellers, but is required because they constitute a valid legal contract among members of the code.

Commercial Resolutions as Approved by the Directors of the American Iron and Steel Institute

1. Special terms for sales of pipe to jobbers. Aug. 29.
2. Special terms for sales of pipe to jobbers in lieu of consignment stocks. Aug. 29.
3. Special terms for Pacific Coast jobbers. Aug. 29.
4. Special terms for sales of woven wire fencing. Aug. 29.
5. Sale of pipe to jobbers at less than published base price. Aug. 29.
6. Allowances on sales in indirect export. Aug. 29. Amended Sept. 20 and Oct. 27, to be effective Nov. 3.
7. Arbitrary switching charges at Gulf and Pacific Coast basing points. Aug. 29. Superseded by No. 20, effective Nov. 22.
8. Reductions in delivered price on products delivered by other than all-rail transportation. Aug. 29. Amended Oct. 27 and Nov. 15, to be effective Nov. 22.
9. Minimum rate of interest. Aug. 29.
10. Reductions in price of Southern foundry pig iron. Aug. 29.
11. Delivery of plates, shapes or bars for an identified structure to which there is no through freight rate with fabrication-in-transit privilege. Aug. 29.
12. Deductions in prices of products sold in less-carload lots. Aug. 29.
13. Deductions in prices of products sold for delivery in lower Michigan. Sept. 20.
14. Deductions in prices of cold-finished bars. Sept. 20.
15. Deductions in prices of barrel hoops. Sept. 20.
16. Deliveries of products by truck at places not reached by all-rail transportation. Sept. 20.
17. Qualifications of jobbers of tool steel. Sept. 20.
18. Delivered prices for products destined for Canal Zone or Alaska. Sept. 20.
19. Sale of products to United States Government. Sept. 20.
20. Switching charges on products to be delivered at basing points. Sept. 20. Amended Nov. 15 and Dec. 14, to be effective Dec. 18.
21. Filing of contracts existing Aug. 19 for all or part of customer's requirements to be specified on or before Sept. 30. Sept. 20.
22. Deductions in prices on products for an identified construction project. Sept. 20.
23. Modification of paragraph five of jobber's agreement. Sept. 20.
24. Sales of products in intrastate commerce in certain states. Sept. 20.
25. Interpretation of certain provisions of schedule G of code. Oct. 12.
26. Allowances on sales of pig iron for indirect export. Oct. 12.
27. Deductions from base prices of certain tubular products. Oct. 27.
28. Shipments of pig iron before Dec. 31 under contracts specifying delivery before Sept. 30. Oct. 27.
29. Deductions from base prices of products sold to railroads. Oct. 27.
30. Payment of invoices. Oct. 27.
31. Date of payment of invoices. Nov. 15.
32. Interest payments on invoices. No. 15.
33. Sale of rails and track supplies prior to March 1, 1934. Nov. 15.
34. Interpretation of exception made in section 9, schedule E of the code with respect to products required by a Government department or division for a definite project, or required by a purchaser for a definite project financed by a Federal agency.
35. Deductions in base prices of products sold in less-carload lots for delivery at warehouse or railroad freight station.
36. Filing of base prices for miscellaneous wire products. Dec. 14.
37. Application of ocean and rail-and-ocean freight rates. Dec. 14.
38. Allowance of freight charges on products sold to railroads for delivery on their lines. Dec. 14.
39. Agency agreements. Dec. 14.
40. Deductions in base prices of hot-rolled strip. Dec. 14.
41. Filing of base prices for descriptions of products not heretofore included in any base price list.

Copies of all these resolutions are available from the secretary of the American Iron and Steel Institute, Empire State Building, New York.

Future of the Code

With four months of successful operation behind it, what of the future of the code in the iron and steel industry? How long will it continue? Will it survive the national emergency which led to its inception? It is the belief of many that most of the desirable features of this plan of self-government in a great industry are likely to be retained. It is also believed that the commercial provisions of the code do not conflict with the laws of the land as effective before the advent of the NRA. The code does not fix prices. It does not limit production, even though it wisely prohibits additional iron and steel making capacity in an industry which is already overbuilt. Competition is by no means wiped out. It is merely regulated according to principles to which the leaders of the industry have long sought to adhere.

Assuming, then, that the code in its present form, or something similar, is likely to be continued, what of the conduct of business in the future? First, it may be assumed that a new type of salesmanship will be required. Business will no longer be obtained by cutting prices. With many basing points, producers will have a better opportunity to supply the demands of their natural consuming territories. But sellers in the large production centers must concentrate on quality and service. They must pay more attention to the particular needs of their customers. The salesman must be prepared to do more than take orders. He must realize the potentialities of the products he sells, particularly when these products are destined for further processing.

On steel sold for unspecialized purposes where an identical product can be supplied by several makers, delivery and service will be more important factors. It may be necessary to maintain larger stocks.

Of doubtful value will be the probable incentive offered to reciprocity buying. A consumer will be more anxious to place his business with a company which buys his products if he is certain a lower price will not be made by someone else. However, reci-

(Concluded on Page 182)

In Planning 1934 Industrial Sales, You Must Consider These Trends

By JOHN H. VAN DEVENTER
Editor, THE IRON AGE

"HOW can we rebuild sales volumes in 1934?" That is the dominating question in the minds of makers of metals, manufacturers of metal products and builders of machinery and industrial equipment.

Volumes *must* be rebuilt to above "break even" points. Company surpluses will not stand another year of leakage. Even the NRA objectives of higher wages and greater employment, as well as individual or corporate survival, are dependent upon securing the wherewithal to pay the bills.

Merchandising plans are and will be the cynosure of managerial attention. Their making is now attended by unusual difficulty. For the seller must now play his cards from three decks. Not alone must he consider the complexities of the New Deal and its effects. Powerful economic cards are still circulating from two other deals, that of depression and even that of pre-depression times.

Three distinct groups of powerful factors are at work changing the market map and shifting its points of penetration. Some of them may not apply to your business; most of them do. Certainly no merchandising plan can be dismissed as well considered unless its making includes the careful weighing of the effect of each factor.

One group of five factors is a "hold-over" from pre-depression times. They represent long-term influences which may or may not have been clearly recognized, but which will continue their work for years to come.

A second group of seven factors has been brought into economic play as the result of four years of depression. Less permanent than the previous ones, perhaps, they nevertheless will act powerfully upon merchandising for several years to come.

The third group of seven factors contains the forces which have been set in motion by Recovery legislation and administration. These factors will leave their mark, for better or worse, on every business transaction made in 1934.

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Pre-Depression Factor No. 1:

The outstripping of normal demand by productive capacity.

THE slowing down in the growth of demand for many industrial products is independent of the depression and has been in evidence for the past 12 years or more. The trend of steel, which is a basic metal-working barometer, illustrates this. Excessive outputs in single years have tended to hide this fact, but a compilation of output per capita on the basis of five-year averages shows that the turn of the curve came in 1918-1919. This does not mean that consumption per capita (disregarding the depression) would have decreased, but it does mean that the rate of increase in each succeeding period tends to become less.

On the other hand, there was no corresponding let-up, before the depression, in the acceleration of productive capacity.

EFFECT ON FUTURE MERCHANDISING. This long-term factor will be at work in the years to come regardless of NRA or other administrative changes. It is an economic law—the law of diminishing returns, which transcends all man-made laws or code arrangements. It is forcing and will force the metal-working industry to become "distribution minded"—something unthought of a few years ago but now becoming evident. It will compel the successful company to approach much closer to its customers and their needs through intelligent market study. It demands the more careful definition of "supremacy areas," both technical and geographical, for given products as a means of decreasing sales resistance and overcoming increasing competition brought about by this factor. It means the relegation of the idea of "volume" to a place second to the idea of profits.

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Pre-Depression Factor No. 2:

The general trend toward "hand-to-mouth buying."

THIS is a long-term factor brought about during the past 10 years or more by realization of consumer plant economies to be made by holding down both raw material

and goods in process inventories. It works in favor of the consumer of metals or metal products as well as all suppliers of industrial materials and against the producer. This, too, is a continuing factor, since it has become quite definitely established that the manufacturer's function is to make his profit on sales and not through speculative long-term buying.

This policy, of course, was grossly accentuated by the depression, during which "hand-to-mouth buying" actually became "chin-to-lip" buying. While it is to be expected that average purchased lots will increase with the resumption of normal conditions, it must be remembered that as efficiency of management control increases in industry, and as improvement in transportation expedites deliveries, the regulation of inventories will become more generally practiced.

EFFECT ON FUTURE MERCHANDISING. By lowering the differential between dollars per customer sale, this buying policy makes the average and smaller-sized consumer of more relative importance. This, in turn, has a direct bearing upon methods of market coverage and merchandising practices in selling, since it calls for a relative increase in selling effort directed toward the smaller industrial consumers. It also indicates the need of more efforts to keep customers sold, since they are, in general, committed to the seller for shorter periods.

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Pre-Depression Factor No. 3:

The intensification of competition in the metal-working industry and particularly in the industries to which it sells.

THE outstripping of demand by productive capacity in the metal-working industry brought about an intensification of competition which was well known and recognized even before the depression and which resulted in the destructive practice of using price, in many cases, as the chief sales argument. While the price situation is ostensibly cured by codification, nevertheless over-capacity remains, and competition also. There is no reason to expect a let-up of competition during the next several years.

EFFECT ON FUTURE MERCHANDISING. In the "open price" industry, with the price factor removed and with competition remaining and probably increasing, this calls for the accentuation of other sales reasons, prominent among which are quality and service. This, in turn, calls for intensive customer education and more effective sales promotion based upon "value in use."

But this same factor is at work in the markets of every fabricating consumer. The problems of those who buy become the problems of those who sell. While price control does not enter into most of the metal consuming industries, competition in them demands all of the aid that the metal or equipment producer can supply and indicates the need for a more thorough study of customer requirements to the end that consumers can be aided through decreased costs of their products (not resulting from price but from more intelligent application) or improved quality and sales appeal.

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Pre-Depression Factor No. 4:

The elaboration of customer requirements, due to the rapid diversification of customer industries and the equally rapid pace in the technical application of customer products.

TECHNICAL progress is a seed that bears ten-fold and customer requirements have been and will elaborate and diversify at an increasing pace. The production of an alloy steel of special properties, for example, gives rise to hundreds or perhaps thousands of new applications which in many cases are unforeseen and even unknown to the producer.

Metallurgical developments have come so fast during the past few years that there is danger of potential markets of considerable value being overlooked and remaining undeveloped for a longer period than necessary. Metal producers, of course, cannot undertake to direct consumer applications in detail, for the consumer is close to the application and the producer is removed from it. On the other hand, the consumer who applies a new material or who makes a new application of an old one cannot or does not visualize the related possibilities for expanded markets which lie in applications to other uses suggested by his application. That is a job for the producer.

EFFECT ON FUTURE MERCHANDISING. If the producer is to tap the potentialities of new markets suggested by new applications of either new or old products, he must facilitate consumer use in varied lines by taking several steps.

First: To specifically and repeatedly set forth the physical, chemical performance or other qualities of new products in such manner as to acquaint the possible consumer with their advantages and limitations.

Second: Set up a means of tracing new customer applications.

Third: Make these applications known as broadly as possible to the trade as a means of suggestion to other consumers of related applications.

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Pre-Depression Factor No. 5:

The increasing aggression of competing material industries.

INCREASING pressure will be brought upon the various divisions of the metal-working industry by the competitive efforts of other divisions to enlarge its markets. Aluminum, for example, is making a drive for business in the railroad equipment field. Cement, due to aggressive promotion, is getting its share of public works. Copper and brass are hammering constantly at the construction industry. Casting is feeling the competition of welding; stamping, that of die-casting.

EFFECT ON FUTURE MERCHANDISING. Primarily, this is a problem for the divisions of the industry and not for the individual company to undertake. It is important to the individual company, however, that it be undertaken, and that its product shall not suffer by being taken for granted while competing industries are fostering public consciousness of their materials or methods as superior in fields where others have legitimate application.

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Depression Factor No. 1:

The large mortality among industrial units, many of which were your customers or prospects.

ONE of our large research bureaus is responsible for the statement that the depression was responsible for a mortality of at least 33 1/3 per cent in the number of our industrial units. Also, that among the remaining units, there has been at least as great a turnover in executive personnel.

Certainly the market map for all who sell to industry has been materially changed and must be completely re-

surveyed. This applies to materials and machinery as well as to most other industrial products.

EFFECT ON FUTURE MERCHANDISING. New contacts to be made, new people to be sold; a new market picture. This clearly indicates the need for a resurvey of promotional activities and a decided intensification of them.

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Depression Factor No. 2:

The marked turnover in personnel in surviving concerns, which has materially altered selling contacts.

AS stated before, there is no question of the marked turnover that has taken place among those who initiate and who approve of purchases in the industrial field. There is a new crop of prospects to be educated in the merits of your products, even in those plants that have been habitual customers. It follows that there must naturally be, among these "who know not Joseph," a large number who are vulnerable to the arguments and claims of your competitors.

EFFECT ON FUTURE MERCHANDISING. It is necessary to review promotional work in order to hold the ground that was gained before the depression, and an intensification of it in terms of present-day needs is advisable, if these gains are to be consolidated, advanced and continued.

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Depression Factor No. 3:

The increasing trend toward new products among manufacturers of both consumer and capital goods as a means of stimulating sales.

THIS is one of the most marked of the merchandising trends of the depression among consumers of materials and users as well as makers of equipment. Nearly every concern has endeavored to increase its sales during the depression by bringing out new products or by improving quality or finish of old ones. This is true in the capital goods industries, where better performance has been emphasized and in the consumer goods industries, where appearance has been considered a selling asset.

EFFECT ON FUTURE MERCHANDISING. Suppliers of materials and makers of equipment must certainly take account of this trend, which is likely to continue, since it has been quite successful. The consumer to whom you sell or will sell in the future needs more help from you to make *his* products more salable.

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Depression Factor No. 4:

The increasing tendency to buy and sell on price, due to a decided buyer's market. (Now changed in certain cases by NRA developments.)

NO comment is necessary on this obvious point.

EFFECT ON FUTURE MERCHANDISING. Having pursued sales for a long period through the channel of price, many companies have neglected the other sales factors, or at least have permitted them to become rusty. These other sales factors must be polished up, sharpened, and put to use. The demonstration of *profitable use* of the product must replace the offer of a price attractive from the competitive angle. This will require considerable educational work among the sales people. Advertising directed to the customer can well be used to educate the salesmen of the companies endeavoring to reach these customers.

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Depression Factor No. 5:

The "moving upstairs" of buying decisions throughout industry, so that higher officials than formerly pass on all purchases.

THE need for close control of expenditures, brought about by the depression, has been responsible for moving buying decisions upstairs. It is likely that they will stay there for some time to come. This factor, together with depression factor No. 2 (turnover), calls for a renovation of mailing lists and for the cultivation of new sales contacts to find the man or men who buy.

EFFECT ON FUTURE MERCHANDISING. Sales organizations which have not already done so must put prospect cards and mailing lists "on suspicion" and take steps to bring them up-to-date.

Publicity and promotion must be directed to the type of men who are found to be most influential in the new purchasing set-up.

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Depression Factor No. 6:

The shrinkage of American purchasing power and its redistribution.

THE serious loss in American income during the past four years cannot fail to have an effect that is reflected upon demand for materials and equipment. Metal products, whether for railroads, construction industry or any other purpose, are bought by those who fabricate it into these products, but are paid for by ultimate consumers, such as people who ride on trains and who rent houses. Government projects are paid for by the taxpayers. It stands to reason that loss of purchasing power increases future sales resistance all along the line.

Even the attempt to lift ourselves by our bootstraps represented in higher wages and shorter hours may have its effect in reverse, instead of forward, as expected. That is, if costs are forced up faster than purchasing power, and many people think this will happen.

EFFECT ON MERCHANDISING. Present movement is a redistribution of wealth rather than an increase. Low-income groups benefit from it, but high-income groups are penalized. Merchandisers will do well to study the direct and indirect buying influence of the low-income groups, which, collectively and relatively, may have more money to spend than formerly.

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Depression Factor No. 7:

The changed relation in the importance of large and small consumers.

DEPRESSIONS are "leveling off" processes to some extent, but in this depression the larger units have in general been pushed down more than the smaller ones. Also, the smaller units are likely to contain more new technical developments than the larger and older ones. Smaller units have taken less beating also because of more conservative capital structures. It is easier for little concerns to grow larger than for big ones.

EFFECT ON FUTURE MERCHANDISING. Cultivate the smaller consuming units. Watch their development work and investigate the potentialities for your prod-

ucts. Among these little fellows will be some big customers a few years from now. It is easier to establish friendly relations when the customer is small than after he gets big and perhaps feels independent.

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NRA Factor No. 1:

The official pronunciation of the theory of an industry's responsibility for maintaining employment among its employables.

THIS is the "spread work" idea as officially incorporated into NRA objectives.

Without questioning the social issues involved, this policy dilutes the selectivity of management with respect to labor and has a distinct tendency to lower the average efficiency of labor. In combination with a number of other factors, such as Government patronage of unionism, it will have the tendency to raise cost.

This same principle, of course, carries over into the capital goods industries, to which our industry sells so largely, and with the same effect.

Theoretically, capital goods producers and their suppliers can raise their prices enough to compensate for such increased cost, but from the practical standpoint, this is not true, for there is a point at which sales resistance to increased price will bring a distinct curtailment of demand. Thus the producer is under pressure from both within and without to effect economies and to keep prices below the point of detrimental sales resistance. And he is more or less prohibited from securing these economies through the usual channels of improving labor efficiency in terms of output per man.

EFFECT ON FUTURE MERCHANDISING. There are two broad divisions of cost: the cost of making and the cost of selling. Cost economies have heretofore been most largely sought in the field of making, and most prevalently, through the method of increasing output per man per hour. Greatly increased resistance to this has been introduced by the "New Deal." Hence, economies will have to be sought more diligently in the field of selling than hitherto. Sales must be "bought" by the merchandiser more economically than in the past, which means that promotional work in its broad sense must be undertaken with more care and intelligence.

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NRA Factor No. 2:

The empirical raising of costs of all goods and manufactured products through the mandatory increase in wages.

THIS factor works in the same direction as the preceding one, in bringing pressure upon the executive to effect sales economies. It emphasizes the necessity of arriving at detailed costs of sales in the same measure as manufacturing costs are detailed.

From the standpoint of the consumer of any metal machine or metal-product, it makes the matter of intelligent buying more important than ever. The maker of metal products, in order to maintain his sales under higher labor cost, must pay more attention than ever to selecting his materials with regard to economy and also with regard to quality effect.

EFFECT ON FUTURE MERCHANDISING. In introducing a keener interest on the part of the buyer in the suitability of products offered for his purposes, it also introduces a larger opportunity for the maker to obtain an interested hearing for what he has to sell. But this calls for more specific publicity than the too-frequent mere listing of available products.

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NRA Factor No. 3:

The serious possibility of decreased general purchasing power, if price increase outstrips wage and dividend purchasing power increase under the new program.

A GOOD many well-informed people are doubtful of the results of attempting to lift ourselves by our economic bootstraps through the artificial application of the higher-wage theory. They believe that it is impossible to keep prices from climbing as fast or even faster than wages. And that instead of increasing general purchasing power, the net result of these efforts may be to diminish it.

If this works out as they believe, it will introduce fiercer competition than ever between companies in an industry and between industries. With less pie to go round, there will be a keener struggle on the part of everyone to get his piece.

EFFECT ON FUTURE MERCHANDISING. If this situation should develop as some anticipate, it would seriously jeopardize the open price policy of those industries which have adopted it under codes. But if the open price policy should hold in the face of it, which would be probable for some time at least, it will mean the use of greatly intensified sales effort to get a proper share of the business to be had.

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NRA Factor No. 4:

The increase of cost due to shorter hours and the increasing resistance of labor to the principles of efficiency.

UNTIL industry becomes sufficiently improved from the standpoint of mechanization to adjust itself to shorter hours and higher wages, there is no avoiding increased cost. On top of this, the encouragement of labor to "assert its rights," on the part of the Administration, is already introducing disturbing factors. Strikes are not the most serious of these. A more serious one is the general letting down of individual effort, on the theory that work done is less important than hours put in or dollars taken out.

EFFECT ON FUTURE MERCHANDISING. Same as NRA factors Nos. 1 and 2.

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NRA Factor No. 5:

The operation of the Securities Act of 1933.

THE Securities Act which passed the last Congress virtually makes it impossible to market new stocks or bonds because of the hazards involved to issuing corporations and investment houses and more particularly, the individual responsibility imposed on all directors, engineers, accountants, appraisers, etc., who take any part in such issues.

Since capital equipment is bought through loans and not through earnings, these loans being secured by new stock

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(*Continued from Page* 54)

or bonds, this situation has a drastic effect on sales of new equipment, such as normally account for a large volume of metal-working business.

The Administration, sensing the necessity of stimulating the capital goods industries and finding that private investors will not assume the risk, is promoting such plans as that of the rail-buying program, in which the Government will do the financing. Thus, with the Securities Act discouraging private investment, and the need for action forcing the Government into the investment banking business, a larger volume, in proportion to normal, should go into enterprises under Government auspices as contrasted with that bought through private investment in capital goods.

EFFECT ON FUTURE MERCHANDISING. From the standpoint of tonnage material going into construction enterprises, the expectation of a larger portion than formerly that is subject to political control or influence.

From the standpoint of the relative decrease of capital goods financed by private investment, an increasing emphasis on consumer goods in which metals and metal-products do or may take a part.

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NRA Factor No. 6:

In the basic industries, particularly the elimination of price as the most powerful sales argument.

ONE of the most drastic changes that NRA has made in steel merchandising is the adoption, under code, of the open-price policy and the united action of the industry to eliminate price competition. This, in large measure, if maintained, will completely revolutionize the old method of merchandising, in which price was unmistakably a powerful factor.

With price out of the picture as a sales inducement, it must be replaced by more legitimate and less crude arguments. Concerns which heretofore may have secured most of their business on the reputation of establishing their sales headquarters (or hindquarters) in a price cellar must replace this with another kind of reputation. In some cases, this will require a good deal of missionary work, both within the organization and outside of it.

EFFECT ON FUTURE MERCHANDISING. Steel, which has been so long price and volume-minded, must become sales-minded in the broad sense of the term. In its specialties, it must sell quality and ideas for saving its customers money; on commercial tonnage, it must sell service advantages. It must put the idea of merchandising ahead of the idea of production, obtain the best quality of sales direction; probably replace some of its existing sales force. It must appropriate, for sales promotion, an amount more nearly in proportion to that percentage of gross sales to that which has been found necessary by other industries.

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NRA Factor No. 7:

Tariff and exchange complexities.

EXCHANGE and tariff complexities, combined with competitive situations abroad, have virtually dried up our export markets. For some time to come, or until there is stabilization of exchange, the home market will be practically the only one holding prospects for immediate business. Unless, of course, we encounter dollar devaluation or an inflation of currency sufficient to overcome competitive advantages abroad. Some concerns are already feeling increased foreign demand because of our dollar shrinkage.

EFFECT ON FUTURE STEEL MERCHANDISING. Sales effort and money spent in developing the home market may be regarded as an investment. The development of foreign markets at this time is a pure speculation, since changing values or embargoes may overnight wipe out all gains that are made.

* * *

Regardless of one's conclusions as to the effect of each of the foregoing factors on his individual business, no one can survey them collectively without arriving at a general, definite conclusion. It is that the operation of these factors will increase sales resistance to both capital and consumer goods throughout the coming year. These factors are not sales boosters; they are sales depressants. Their force is directed toward pushing the dollar volume curve downward. Even with the normal growth of business that may be expected to accompany a gradual recovery such as we hope for and expect, greatly increased effort must be devoted to sales promotion. By and large and with some notable exceptions, the metal-working industry has never done a first-rate selling job. It has made and is making the "better mouse traps"; now it must learn how to bait them.

GEORGE W. ALCOCK

The Railroads and the Steel

by GEORGE W. ALCOCK

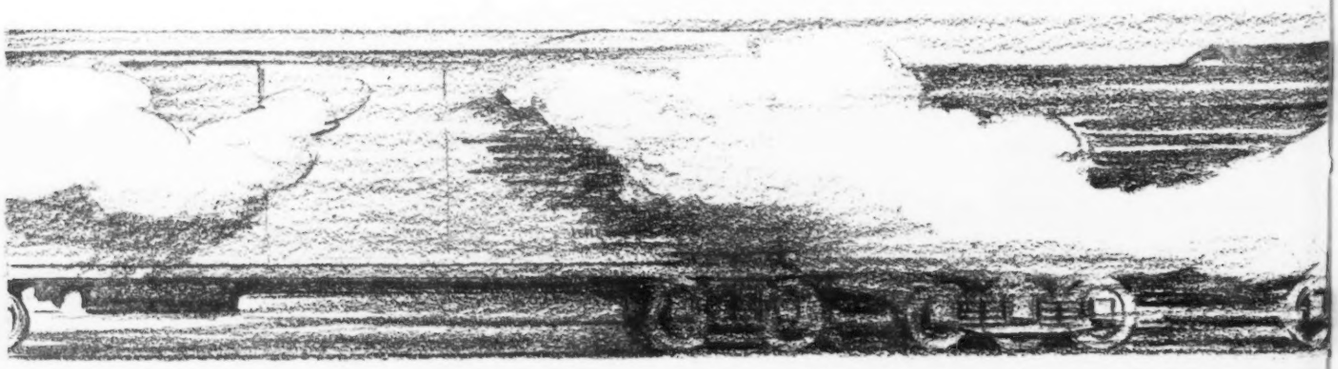
THE wealth of a nation is in direct proportion to the development and utilization of its natural resources. Conversely the development and utilization of the natural resources of a nation are in direct proportion to, and limited by, its transportation facilities. Chicago's successful Century of Progress brings back memories of that earlier pageant of industrial development, the World's Fair of 1893, where over the entrance to Transportation Hall there was inscribed a quotation from the famous Macaulay:

"Of all human inventions, the printing press alone excepted, those which abridge distance have done the most for civilization."

The contribution of the railroads toward the industrial development of the United States through the abridgment of distance has not been a negligible one. With less than 8 per cent of the world's area and with less than 7 per cent of the world's population, the United States has 31.4 per cent of the world's railway mileage. It is readily apparent that railroad construction has exerted considerable influence on the nation's development.

Unfortunately for the steel industry, the railroads have suffered out of all proportion to other industries during the last few years through the development of competing forms of transportation, which have been allowed to operate free from all legislation and regulation to which the railroads have been compelled to submit. These conditions of unfair competition must be given serious thought in any study of the many factors which will exert a controlling influence on a return to more normal conditions in the iron and steel field. The situation is critical, but it is not by any means hopeless. Legislation at the coming session of Congress seems almost assured. This legislation, if it is constructive and in the public interest, will have a tremendous influence on that return to the purchase of capital goods by private industry so essential to the successful solution of the President's economic program. The creation of unnecessary facilities through the expenditure of public funds in order to provide work for unemployed is at best a palliative, involving an ever increasing burden on the taxpayer. Industry will not be reestablished on a stable basis until private enterprise resumes the purchase of capital goods and manufacturers are enabled once more to resume income tax payments on operating profits.

One of the greatest single factors in a return to industrial activity would be the rehabilitation of the purchasing power of the trunk line railroads. Any improvement in the railroad situation whereby they were enabled to resume even a moderate purchasing program would be immediately reflected in every branch of the iron and steel industry. Nothing permanent in this direction, however, need be expected until there is some rational re-codification of transportation legislation, whereby all forms of transportation will be regulated in the public interest, so that the railroads will be allowed to operate under regulations at least as fair as those accorded competing agencies. The railroads are the largest single buyer of iron and steel products, they are the largest single taxpayer in the United States, they are one of the largest employers of labor, they are one of the largest users of coal and of forest products, and are of vital necessity to the life of the nation both in time of peace and in time of war, yet it is one of the strange paradoxes of our times that, the National Recovery Act notwithstanding, they are faced with competition so unfair that it would not be tolerated under any



Industry ▲▲▲

OUR railroads have been the godfather of the American metal-working industry. Their demands for rails and equipment formed the nutriment upon which the infant steel industry became a giant. Few realize how much, even today, our industry depends upon the needs of "the iron horse."

The Administration undoubtedly recognizes the close bond between railroad rehabilitation and the rehabilitation of the principal capital goods industries. Those in the capital goods industry need to study the problems of the railroads, so closely tied up with their own immediate and long term futures.

Mr. Alcock has given us a clear and comprehensive picture of these relationships; an unusual insight into present day developments and an idea of how we can aid in their fulfillment.

code signed by the President. The reason for this is that the laws and regulations covering railroad operation are not the development of the last few years. They have been built up from time to time since the passage of the original act creating the Interstate Commerce Commission in 1887.

Any industry serving the public such as the railroads should be regulated in the public interest, and the enactment of railroad legislation in its inception was undoubtedly in the public interest as it then obtained. There were no competing forms of transportation, and legislation, both federal and state, was all based on the then correct assumption that the public interest was best protected by creating and maintaining the utmost competition among the railroads themselves. This is the foundation stone of all rail legislation and regulation.

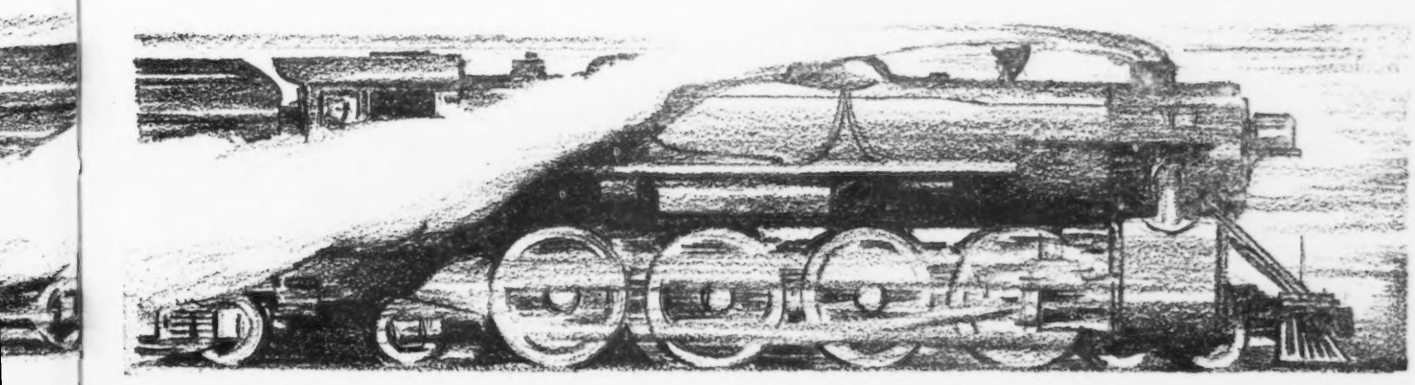
Transportation Industry Evolutionized

Transportation as an industry has undergone an evolution, however, and the conditions of twenty years ago no longer obtain. The railroads have to compete with other forms of transportation, highway, waterway, pipe line and airway. The basis of 1887 is no longer fair either to the public or to the railroads, in which the public has a vital interest as a national necessity. While other forms of transportation should be encouraged to the utmost, it is evident that no development either at present in existence or in prospect can fill the transportation needs of the nation, and that the integrity of the railroads must be maintained. While transportation has undergone an evolution, legislation has gone through no such process, and the iron and steel industry today is suffering from the throttling of the purchasing power of its most important customer due to the maintenance of archaic laws and regulations which have been allowed to stay in effect, and are most rigidly enforced, notwithstanding the fact that the basic causes which made this regulation and legislation necessary have long since disappeared.

Highways and waterways are provided by the taxpayers free of charge to anyone wishing to compete with the railroads. Interstate highway passenger and freight traffic is subject to practically no legislation or regulation. No certificate of convenience or necessity is required; there is no governmental agency with power to promulgate or enforce any of the myriad regulations under which the railroads must operate. They are at liberty to accept freight or decline it at their own will. They can start when and where they want to, and change their route or suspend entirely as they may elect. Their rates are subject to no review, they may raise or lower them at will, and make discriminatory rates as they desire. Such competition is hardly in compliance with the declaration of policy of Congress as embodied in the National Recovery Act.

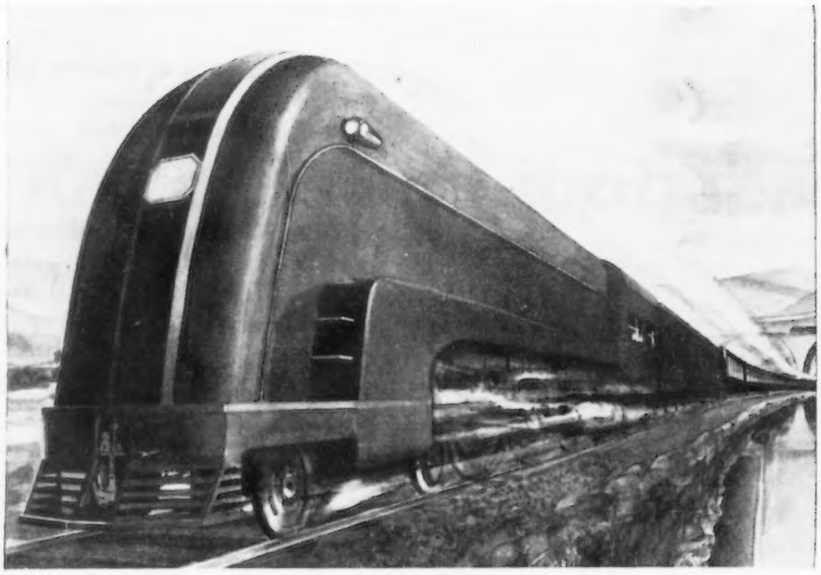
Discriminatory Regulations

As compared with this freedom from regulation which the highway and waterway operators enjoy, railroad rates are subject to approval by the Interstate Commerce Commission, and cannot be changed except by authority of that board. They cannot construct new lines except by permission of the Commission, and they cannot abandon branch lines operating at a loss without similar permission. They are prohibited by law from using the waterways, including the Panama Canal and Great Lakes, and notwithstanding the fact that these waterway facilities, except the

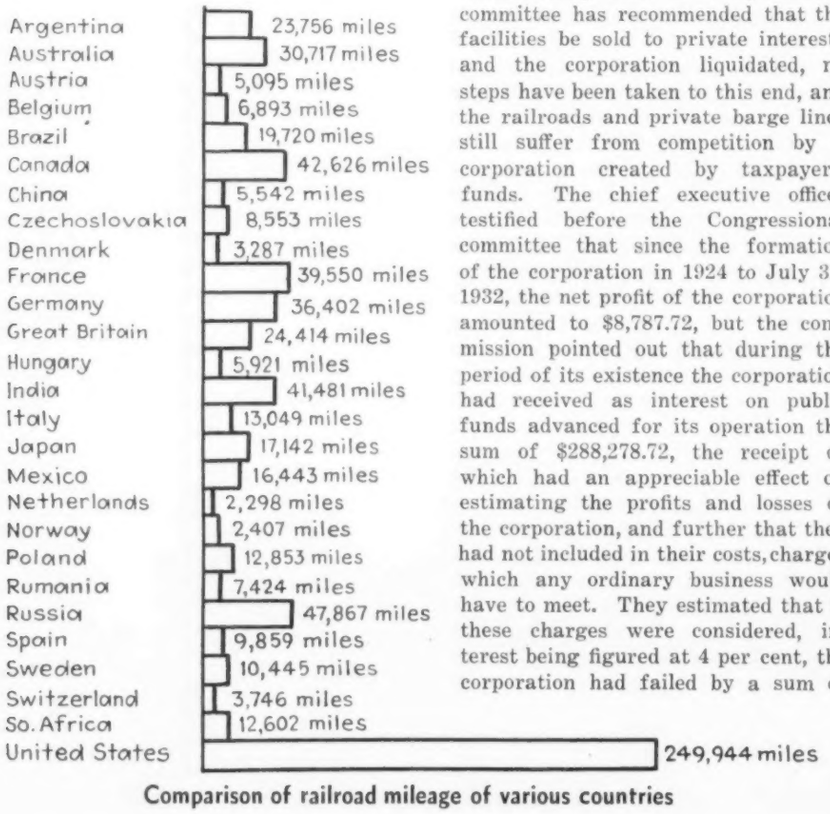


lakes, were created by taxpayers' money, and that the railroads are the largest single taxpayer in the country, they are the only agency prohibited by law from using, either directly or indirectly, waterway facilities. Their labor rates are subject to law, and the number of men per train, and the length of their working hours are matters of governmental supervision. Their method of accounting is prescribed by the Interstate Commerce Commission; their financial structure is subject to review by the Commission; they cannot purchase new equipment on a deferred basis unless all bids are filed with the Commission, and their authority secured to issue the necessary equipment trust certificates. They provide and maintain at their own expense their right of way, and pay taxes on every foot of property they own. Their equipment, type of couplers, ashpans, headlights, style and location of safety appliances, when and how locomotive boilers are to be washed are all compulsory, and subject to inspection and approval by the Interstate Commerce Commission Inspectors who have the sole right to decide whether or not equipment is in safe operating condition.

It is, to say the least, unfortunate that the Government itself has added to the critical condition of the railroads by engaging in barge line operations on the Mississippi and Warrior Rivers. The Inland Waterways Corporation, the entire capital stock of which was subscribed by the Government, operates a line of barges in direct competition with the railroads and other barge lines. The Chief Executive Officer of this corporation is a United States Army Officer reporting directly to the Secretary of War. The Waterways Corporation was organized for the sole purpose of demonstrating that water transportation was feasible and economical. Notwithstanding that a Congressional committee has recommended that the facilities be sold to private interests and the corporation liquidated, no steps have been taken to this end, and the railroads and private barge lines still suffer from competition by a corporation created by taxpayers' funds. The chief executive officer testified before the Congressional committee that since the formation of the corporation in 1924 to July 31, 1932, the net profit of the corporation amounted to $8,787.72, but the commission pointed out that during the period of its existence the corporation had received as interest on public funds advanced for its operation the sum of $288,278.72, the receipt of which had an appreciable effect on estimating the profits and losses of the corporation, and further that they had not included in their costs, charges which any ordinary business would have to meet. They estimated that if these charges were considered, interest being figured at 4 per cent, the corporation had failed by a sum of about $7,000,000 to earn a proper amount for taxes and interest. Their definite recommendation was that the Government should retire from barge line operation.



Streamlined steam locomotive proposed by the American Locomotive Co.



Comparison of railroad mileage of various countries

Steel and the Railroads

Is the iron and steel industry interested in the plight of the railroads? Certainly it should be. In the year 1929, the last predepression year, the railroads spent for materials and supplies the sum of $1,033,164,000, exclusive of coal, and their coal bill amounted to $296,371,000. In the ten years ended with 1931 the railroads spent for improvements and betterments the enormous sum of $7,500,000,000. They spent for materials and supplies about $12,933,000,000. Railroads directly use about 16 per cent of the steel manufactured, 25 per cent of the bituminous coal produced, 20 per cent of the forest products and 18 per cent of the fuel oil. In turn purchases of these industries for equipment and supplies reflect a tremendous influence on the production of steel products, and on industry as a whole when it is considered that it takes about six carloads of raw materials to produce one carload of finished product.

As was pionted out in the review issue of THE IRON AGE for 1933 railroad purchases of finished steel for the ten year period ended with 1931 averaged 21 per cent of the entire finished steel production. According to the table in this issue the average of the railroad purchases of finished steel for this ten year period was greater than for any other single industry. The next nearest industry

was buildings which showed an average of only 17.7 per cent.

Railroad expenditures for materials and supplies for the ten year period ended 1932 were as follows:

1923	$1,738,703,000
1924	1,343,055,000
1925	1,392,043,000
1926	1,559,032,000
1927	1,395,928,000
1928	1,271,341,000
1929	1,329,535,000
1930	1,038,500,000
1931	695,000,000
1932	445,000,000

These figures do not take in expenditures for improvements and betterments. The curtailment in purchases during the last few years has been due to two causes. First the post-war depression and consequent falling off in passenger and freight revenue, and second the competition from other transportation agencies which have played havoc with their rate structure, particularly for less than car load freight. These conditions of competition should be changed by legislation at the coming session of Congress, and with a return to more normal business conditions railroad purchases should be resumed in volume more near the average of 1923 to 1930. The extent to which competing agencies have affected railroad earnings may be seen by the chart herewith showing motor truck registrations yearly since 1921, and the reduction per year in less than carload tonnage originating on the rail lines.

"Plus and Minus" Track Mileage

The construction of new and abandonment of existing rail mileage are also interesting. Figures from 1926 through 1932 are shown on the chart. While the abandonment of existing trackage has undoubtedly been influenced by the nation wide economic conditions, it is interesting to note how abandonments reflect the increase in motor truck registrations. Every mile of track abandoned is a mile for which the steel industry will no longer receive orders for maintenance, and to this extent the industry has a vital interest in helping maintain existing trackage.

The less than carload movement of freight has been most affected by the competition of truck carriers. In tons of freight carried, and distance hauled, our railroads have no counterpart anywhere in the world. Taking the ton-mile as a unit, the enormity of the problem appears at a glance. A ton-mile is the movement of one ton of freight a distance of one mile, and the figures from 1925 through 1932 are as follows:

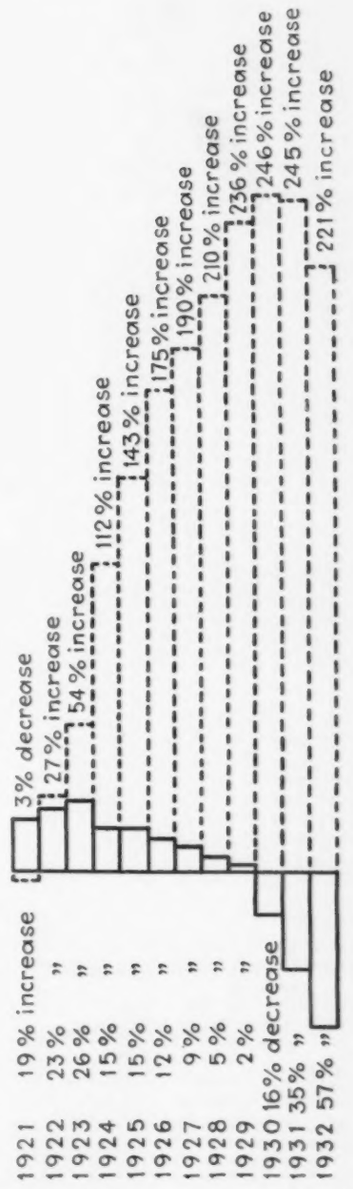
1925	413,814,261,072
1926	443,746,487,348
1927	428,736,961,993
1928	432,915,184,526
1929	447,321,561,129
1930	383,449,588,491
1931	309,224,879,222
1932	234,320,117,000

These figures indicate the necessity of maintaining the trunk line railroads in full vigor, to borrow an expression from the Transportation Act, because no development in existence or in prospect can displace the railroads, particularly when the volume and make-up of freight traffic is considered. The chart on page 63 indicates the make-up of revenue tonnage originating on the rail lines for 1932. This is the total number of separate and distinct tons of revenue freight handled by the railways excluding all duplications, and is the measure of the total freight tonnage offered by the public to the railways for transportation. A study of the chart indicates the extent to which industry depends on the integrity of the railroads being maintained. With 56.1 per cent of the total tonnage originating in the mines it is evident that trucks would be totally incapable of handling the traffic.

Coolidge Committee Report

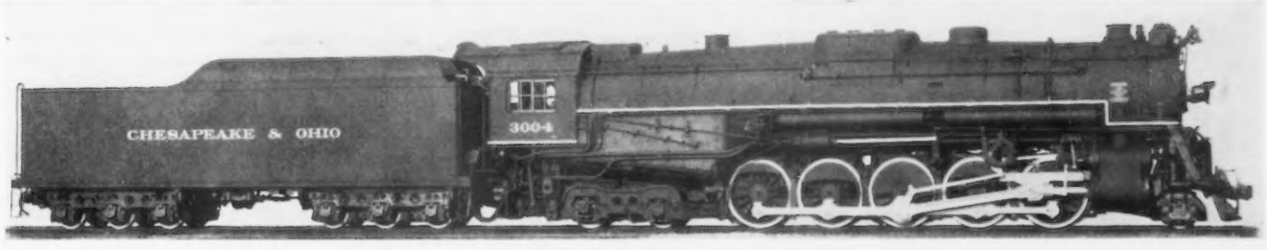
The report of the National Transportation Committee, commonly known as the Coolidge Committee, after reciting the limitations placed on the railroads through regulation of appliances and rates, made the statement: "Nevertheless it cannot be fairly said that railroad advance in applied science is abreast of that in other industrial fields. For example, the improvements in Germany with streamlined Diesel and electric trains of

A steady reduction in less carload tonnage has accompanied the growth in truck registrations.



Dotted lines cover motor truck registrations-percentages from 1920 base

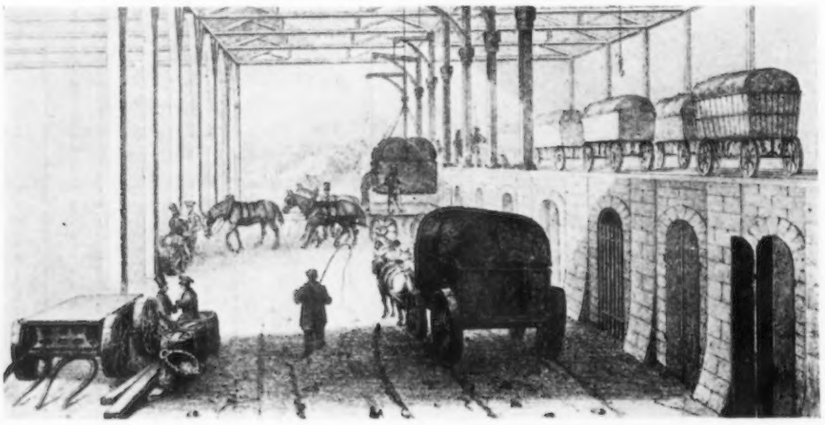
Solid lines cover tonnage originating on rail lines in less than carload lots -percentages from 1911 base



2-10-4 type locomotive built by Lima Locomotive Works, Inc., for the Chesapeake & Ohio Railway Co.

very light tonnage, maintaining schedules of 96 miles per hour to offset motor transport has no counterpart here."

The criticism of the railroads' lack of initiative in developing their service to meet the transportation needs of the country must be tempered somewhat by a glance at what they have actually accomplished. Basically the transportation plant of the railroads converts the energy in coal or oil into gross ton miles of freight or passenger car miles. This is the only thing the railroads have to sell. To transport a ton of freight a mile, or to carry a passenger a mile requires a certain definite amount of horsepower. This is simply an elementary problem in physics.



One of the earliest illustrations of the container system in use, the engraving reproduced above, from the collection of John Phillimore, is without inscription, but probably represents practice on the Liverpool & Manchester Railway about one hundred years ago.

(Courtesy of the Railway Gazette, London.)

Modern container, and method of transfer as used by the Southern Railway of England.

(Courtesy Railway Gazette, London.)

From 750 to 5700 Horsepower

Thirty years ago, in 1903 to be exact, the World's Fair at St. Louis embraced a locomotive testing plant built by the Pennsylvania Railroad, on which the most extensive tests of locomotive performance ever made in this country were conducted. Freight locomotives, typical of the best in service at that time, developed from 750 to 900 hp. at the drawbar, at speeds of from 15 to 30 m.p.hr. These locomotives weighed between 180,000 and 190,000 lb. in working order, and burned coal at the rate of 4½ to 5½ lb. per drawbar hp.hr. These are test plant figures, where the weight of the tender and road conditions were not involved. Today, representative freight locomotives are producing about 5700 hp. at the drawbar in actual road service at speeds ranging from 35 to 50 m.p.hr. Such locomotives weigh about 560,000 lb., and actual road tests show that they burn 2.8 lb. of coal per drawbar hp.hr.

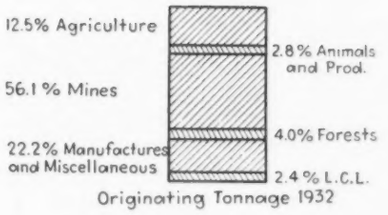
As an indication of the difference in railroad conditions here and abroad, it might be stated that the average goods or freight train on the London, Midland and Scottish Railway of Great Britain weighs from 1200 to 1400 tons, whereas on the Chesapeake and Ohio Railway coal trains of 12,750 tons are regularly being hauled at speeds of 30 to 32 m.p.hr. over a line where the ruling or limiting grade is 0.7 per cent—1¼ miles long and 0.2 per cent—15 miles long.

With the tremendous reduction in the quantity of goods carried on shelves, and the consequent demand for quicker delivery, it is conceivable that railroad operations will change in the not far distant future. This has already made itself evident in freight train speeds, and as a matter of fact since 1920 there has been an increase of 50 per cent in the average speeds of freight trains. Already the four wheel freight car has made its appearance, a ten-ton capacity refrigerator car having been built for the Hormel Company.

Railway Picture May Be Changed

If transportation is brought under one supervisory body, and the present stringent laws and regulations governing the railroads are eased, and other transportation agencies are brought under suitable regulations, the railroads may be depended upon to give the shippers the kind of service the traffic offered demands. What this may be who can tell? For less than car load freight shipments high speed trains possibly combining container cars and small capacity four wheel cars may be demanded, in order to make it easier to give a shipper a carload movement for what is now less than a carload shipment. If this is what is indicated by the traffic offered, the railroad executives and builders of rolling stock may be depended upon to furnish such trains. The coordination of road and rail traffic may change the picture in so far as less than carload shipments, at least, are concerned.

The railroads have a suitable agency already in existence, which could readily be expanded into a nation-wide liaison between road traffic and rail haulage. I have reference to the Railroad Express Agency. The

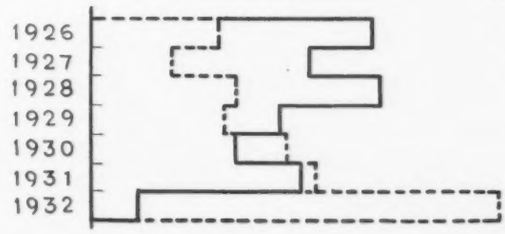


The components of revenue tonnage in 1932 show how interrelated are the interests of industry and the railroads.
See chart at left.

use of this agency as a medium for the coordination of rail and road traffic was suggested by President Sargent of the Chicago and Northwestern Railway Company in his annual reports for 1931 and 1932. The suggestion is logical. Here is an organization with an experience extending back for a period of ninety-four years, with 23,000 offices, 9000 motor trucks and an organization of 50,000 trained people.

As to motive power, certain localities in congested areas will undoubtedly be electrified, but the high initial cost will act as a deterrent to the electrification of hundreds of thousands of miles of main line track. The internal combustion motor has opened a new field. For comparatively low horsepowers this type of prime mover will find a place probably for short haul and switching service, and there will undoubtedly be a marked refinement in the development of Diesel motors. For the expeditious and economical handling of the tremendous passenger and freight traffic of the United States, however, and taking into consideration the limitations imposed by clearances and permissible axle weights, there is every reason to believe that the steam locomotive must be relied upon for some time to come. In this railroads and shippers are suffering no hardship. Probably no other piece of machinery has been so improved from time to time to meet the demands placed upon it. Today steam locomotives are available for any speed requirements the exigencies of railroad service now in sight demand. In performance designers are coming closer and closer to central power plant operating efficiencies, which, considering the clearance and weight limitations, is an exceedingly creditable performance.

The "plus and minus" of track mileage.



	Miles New Track	Miles Abandoned Track
1926	1,005	457
1927	779	282
1928	1,025	512
1929	666	475
1930	513	694
1931	748	795
1932	163	1,452

Passenger Traffic Is Window Dressing

In 1932 the total passenger revenue amounted to 13.3 per cent of the total rail revenue; in 1926 it was 18 per cent. Passenger traffic is the window dressing of the transportation plant. The superbly outfitted passenger trains provide the splendor, but the unostentatious freight trains provide the revenue. Passenger trains are now spoken of in terms of high speed, 110 miles an hour or more. Such speeds are attainable, but whether or not they are feasible without disrupting freight schedules is another matter. In the long stretches of the West there is undoubtedly a place for exceptional speed, if the traffic justifies the expense. In congested areas adjacent to the large cities it is a question if such high speeds could be fitted into the railroad picture.

Extremely light weight trains have been developed on a comparatively small scale to meet the demands for a light, high-speed operating unit. Aluminum and welded stainless steel have been utilized to reduce weight. Internal combustion engines have been used, and streamlining has been carried to a considerable degree. Whether or not cars of such extremely light weight will be the accepted standard, time only will tell. It is possible that some medium between the present standard passenger cars and these extremely light cars may solve the problem, and it would not be surprising to find the passenger trains of the future composed of moderately light weight cars, streamlined, air conditioned, hauled by an entirely new design of light weight, high-speed streamlined steam locomotive. A Pullman sleeping car has already been built for a weight of 100,000 lb., a reduction of about 50,000 lb. from the present standard Pullman of the same capacity. The locomotive would be a new design for American railroads as such a locomotive has never been built here for the very simple reason that for passenger trains of a few cars railroads generally have followed the policy of using old locomotives, discarded from their heavy, through

2-8-4 type locomotive built by Lima Locomotive Works, Inc., hauling a freight train on the Boston & Maine Railroad.

trains. These locomotives, while they are still serviceable, are obsolete from the standpoint of operating economies. In order to reduce operating costs, and meet the competition of the bus and private automobile, this policy of using unsuitable locomotives for light passenger service may give way to a new policy of aggressive competition on the part of the railroads. Such a policy would necessitate the use of locomotives designed for this particular service, capable of developing high horsepower output for a minimum weight, with low maintenance cost, and high operating efficiency.

Expenditures Must Be Justified

Under present conditions with railroads operating under stringent regulations, and other forms of traffic unregulated, it is difficult for railroad executives to convince themselves that large expenditures to meet this unregulated competition would be justified. If all forms of transportation are regulated in the public interest, however, and some reasonable control is exerted over all branches of the industry, it is reasonable to suppose that in order to meet competition the railroads would equip themselves to furnish the type of service the public demands. Unregulated as at present the tendency is to retard development.

There has been some apprehension that regulation of road or highway traffic would not be in the public interest, would be inimical to the bus and truck operator, and unduly favorable to the railroads. Such is not the case, and the experience in Great Britain justifies the statement that highway operators would gain as much as the railroads if the present chaotic conditions are corrected. Highway passenger traffic was regulated in Great Britain three years ago. Freight traffic has just been brought under regulation. If Great Britain, with a greater density of motor truck, bus and private car in relation to area than any other nation in the world, finds regulation wise in the national interest, there is not much reason why we should hesitate. The result in England with the regulation of passenger traffic has been to bring order out of chaos. Bus transportation has been converted from a disorganized industry, continually verging on bankruptcy, to one of national importance, with every indication that it will be a steady contributor to the National treasury through income tax payments on operating profits. The industry now merits financial support with the result that the character and extent of the service have been greatly improved.

British Bus and Truck System Unsurpassed

Manufacturers have developed new vehicles to meet the demands for more efficient operating units, and it is safe to say that the buses and trucks available in Great Britain today are not surpassed anywhere in the world. The evidence is conclusive that regulation has greatly aided both the operators and manufacturers of motor vehicles, the public has benefited through better service, and the government through payments towards the balancing of the budget. The gain to the railroads has clearly not been at the expense of others, and any apprehension here that stabilization is not feasible is seen to be groundless if the experience of Great Britain is to be given credence.

The facts are clear that Great Britain is making material progress towards industrial recovery, and in this the heavy motor vehicle industry is playing an important part. The writer of this article had an opportunity to spend some little time in the manufacturing centers of England this summer. Everywhere, in steel plants, gear cutting plants, machine tool plants, etc., it was evident that a considerable part of the new business then beginning to show itself was for heavy passenger buses and motor trucks. The automobile brought us out of the depression in 1920, and it is not unreasonable to believe that if some comprehensive legislation is enacted at the coming session of Congress bringing all forms of transportation under rational supervision the steel industry would greatly benefit through the development of better motor vehicles, locomotives and railroad cars.

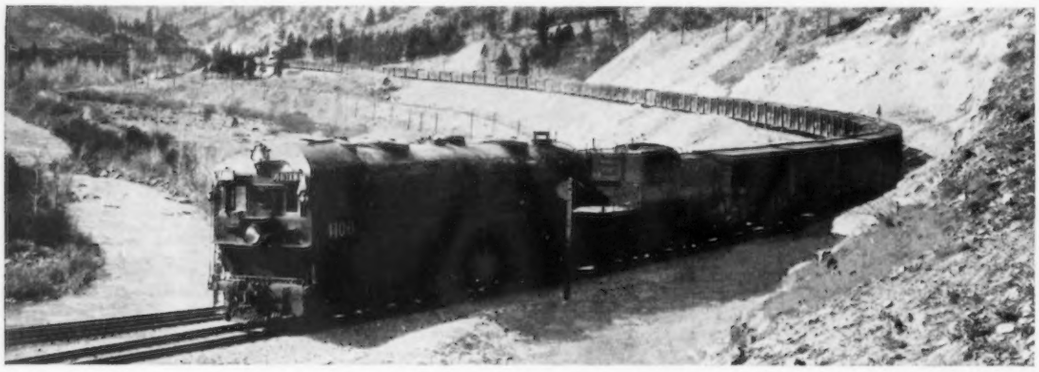
Coordinator Eastman's Study

Joseph B. Eastman, the Federal Coordinator of Transportation, is now making a study of this question of regulation, and it is fairly sure that his recommendations will establish a new era in transportation in the United States. Mr. Eastman's knowledge of railroad conditions gained during his term as an Interstate Commerce Commissioner, coupled with the very extensive opportunity he has had to observe the conditions existing on the highways, and the data which his appointment as Federal Coordinator has placed at his disposal, offer hope that his recommendations will be definitely constructive. If so, and if they are promptly enacted into law by Congress a healthier condition will soon be brought into the transportation industry.

It is not to be expected that these recommendations will be a panacea for all the ills besetting the railroads. There is much housecleaning which the railroads themselves must do. Time at terminals and interchange points for less than carload shipments must be shortened; the excessive competition now existing among the railroads themselves must be modified; there will probably be a better utilization of existing passenger facilities, and of course consolidations and mergers will be effected, all of which will make for a more economical utilization of the transportation plant.

With the establishment of fair competitive practices, and the definite

(*Concluded on Page 67*)



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4-8-8-2 type locomotive built by the Baldwin Locomotive Works for the Southern Pacific Lines hauling a train of 84 cars up the East slope of the Sierra Nevada Mountains in California.

▼ ▼ ▼

NON-FERROUS METALS

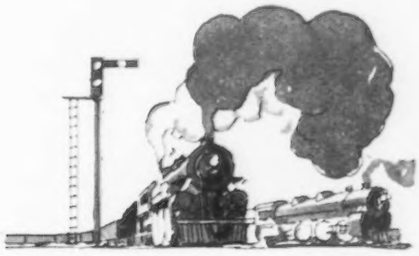
First of all metals used by man
And the herald of the age of progress.
Out of rough hill and rugged mountain,
Primitive man dug the red and white metals,
Melted them in his camp fire,
Hammered them upon stone anvils,
Forming the tools and weapons
Destined to end the stone age.

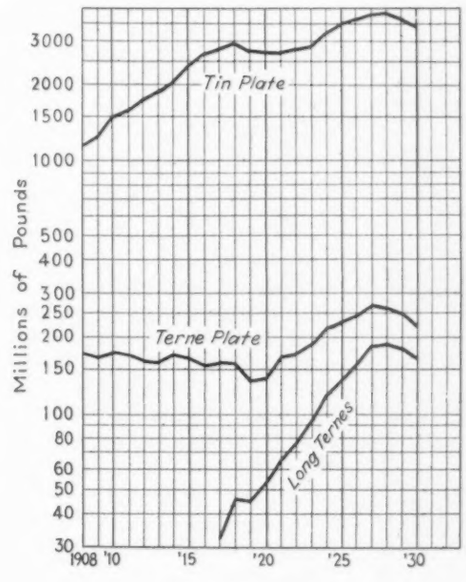
High speed, light weight, "shotwelded" stainless steel fast service built for the Texas & Pacific Railway by the Edward G. Budd Mfg. Co.

(Continued from Page 64)

knowledge that these conditions are sanctioned by law, bus and truck operators would be justified in making capital expenditures. With the improved standing of their customers, motor and vehicle manufacturers could be expected to undertake enlarged programs of rehabilitation.

As an incentive to renewed purchase of capital goods by private enterprise, the stabilization of the transportation industry might easily mark a turning point, as all competing transportation agencies may be depended upon to incur expenditures for new equipment with a view to securing the maximum amount of business offering. To this extent the steel industry is interested in urging Congress to take action promptly when the Coordinator's recommendations are submitted. The capital goods industries need the railroads.





The Showing of Tin and Terne Plate

THE statistics of production of tin plate when plotted on the ratio form of chart show that the rate of growth has not recently been so high as before the war. Five-year averages have been used for the curves, to smooth out annual variations. It is to be remembered that on the ratio chart lines of the same slant represent identical percentage changes. Accordingly it is to be noted that the slope corresponding to the steady expansion of output for the years succeeding 1920 is not so steeply upward as the line for the production from 1908 into the war period, in other words, a lower rate of growth is indicated for the more recent years.

The curve for terne plate illustrates the diminishing demands of the roofing trade for the earlier series of years and the ascendency over the later period of the consumption by the automobile trade for gasoline tanks, a demand which has more than made good the loss of roofing plate sales. The expansion in output of terne plate in recent years up to the peak of the late 1920's appears to have been as rapid as that for tin plate in the earlier years here covered. For example, production of terne plate doubled in the eight years from 1919 to 1927, or from 135 to 270 millions of pounds; in the case of tin plate a doubling occurred in the eight years from 1910 to 1918, or from 1449 to 2897 millions of pounds.

The noteworthy rise in volume of long terne plates is shown by the third curve. The space between that curve and the terne plate curve gives the roofing plate volume. Long ternes from representing 20 per cent of all terne plates in 1917, accounted for 50 per cent in 1923, for 60 per cent in 1925 and fully 75 per cent today.

The averages are based on the production statistics of the American Iron and Steel Institute.

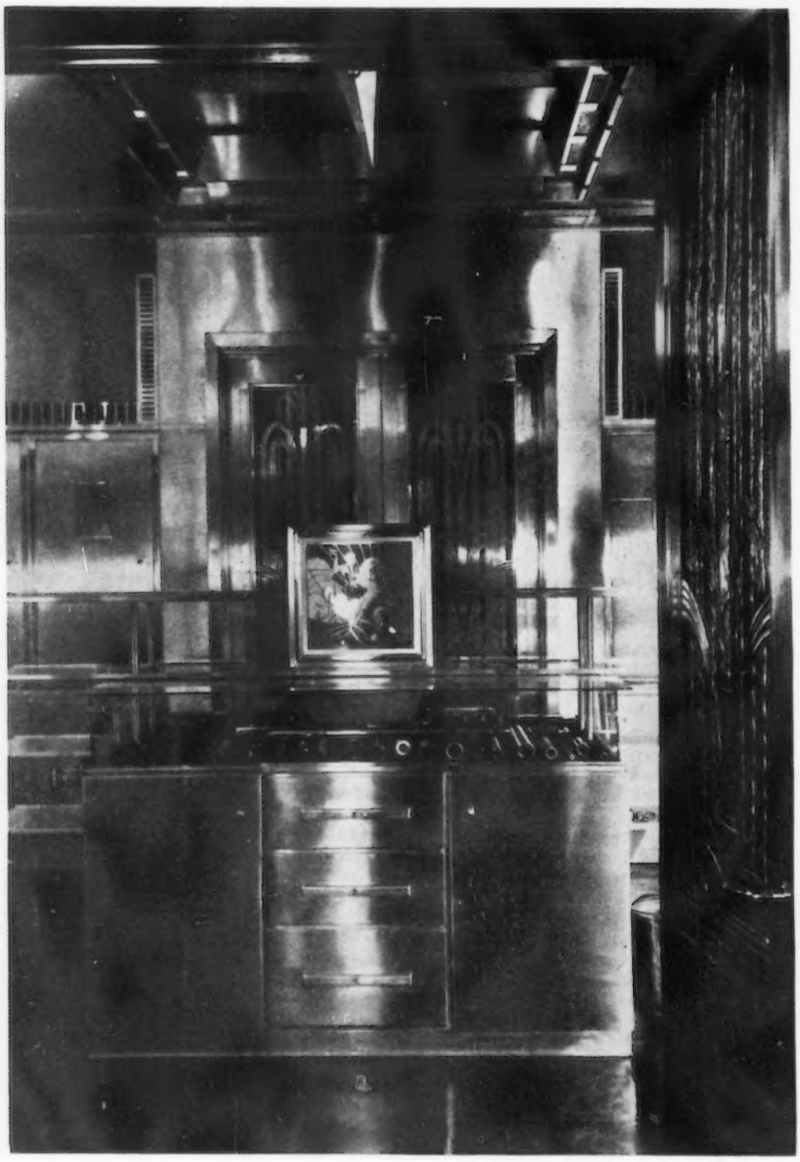
Greater Diversity of Materials Aids

A Review of Developments in 1933

By HERBERT R. SIMONDS

IF, as someone has said, "industry progresses as it has materials to work with," hope should be high for 1934 because never before in the history of man has there been available such a variety of remarkable materials.

In reviewing the progress of 1933 in the metal-working industry, two trends stand out as having special significance. One is a trend toward better finishing and more processing at the primary plants, and the other is a trend toward a new consciousness of the importance of design on the part of the secondary fabricators. "Now, as never before, industry is seeking new designs—and new designs dictate new forms and new materials," said Donald Deskey, designer of Radio City interiors.



The use of new metals and new metal finishes was extended in the architectural field. This shows an all-metal showroom produced by the Ludlum Steel Co.

Examples of the first trend are plated and polished strip, new duplex sheets, pattern materials, lip tubes, and coated and lacquered stock which will stand subsequent stamping and forming. Examples of the design consciousness on the part of the fabricators are to be found throughout the whole gamut of metal products. The movement in 1933 toward better appearance was particularly prominent in the humbler utility items such as hack saw blades and screw drivers. Machine tools and typewriters alike have become style conscious, and the new alloys and new finishing technique have opened up a vast array of new markets for the less expensive metals. Costume jewelry, vanity cases, watches, and other similar items are now being successfully made of steel alloys.

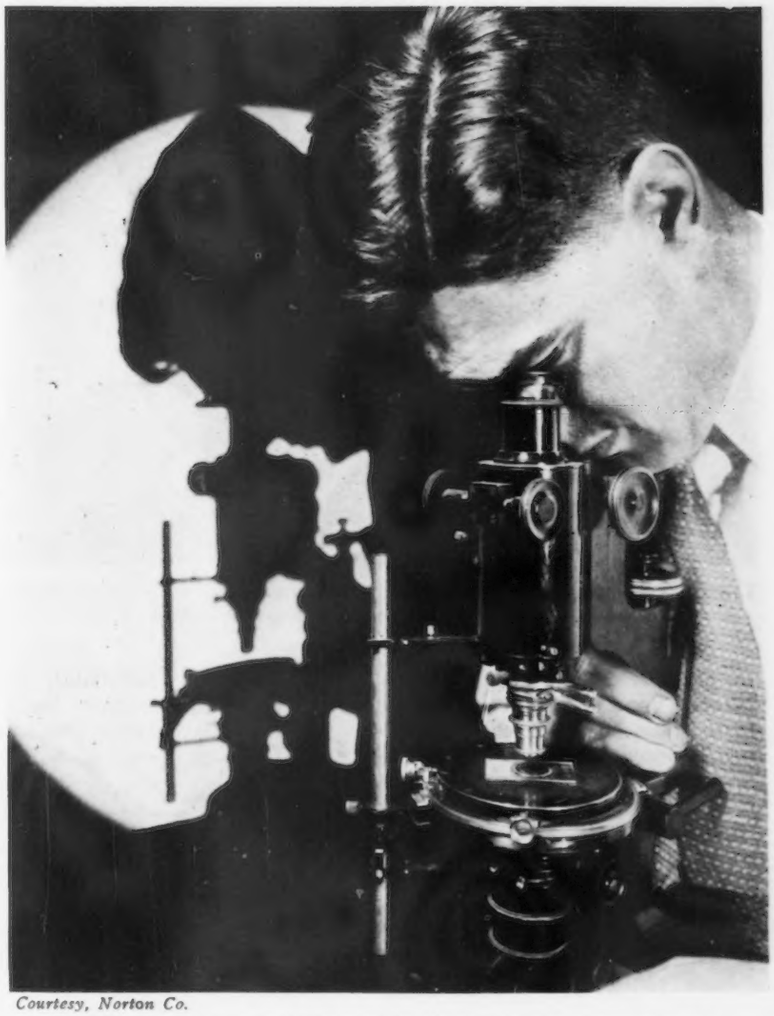
Intermediate Operations Prosper

AN interesting development in the metal-working field is that of the intermediate fabricator. This movement started some years ago, but was extended and increased during the past year. It is a movement intended to relieve the finished product manufacturer of some of the bothersome first operations. The intermediate fabricator is usually located close to a steel mill or other source of raw material so that in operations such as blanking and punching, he effects a saving in freight on the scrap. Pulley manufacturers, for instance, can now buy flat, round blanks which go direct to the first forming press, as against their previous method of blanking and stamping from sheet steel.

Other examples in this field are formed strip for loose-leaf note book manufacturers and elaborate designs in lacquer on sheet steel for later forming into finished products such

Recovery

INDUSTRIES which do not keep pace with new materials, new processes, and new products, lose the coveted places in the front ranks of progress. In 1933 the metal-working industries prepared for the future with energy and enthusiasm such as had not been exhibited since 1929. Nearly twice as many companies submitted records of achievement for this article as did for a similar account of progress a year ago. This review covers 1933 developments under the following headings: steel, alloys, castings, forgings, die castings, stampings, aluminum, copper, zinc, other non-ferrous metals, transportation, and products and machine elements.



Courtesy, Norton Co.

Careful research forms the background for the development of new materials.

as imitation display candy, dolls' eyes, and decorative boxes.

Magnetizing Steel

METALS and plastics have been fabricated jointly with considerable success. A metal stamping, for instance, is dropped into the bottom of a plastic mold and the product comes out of the mold as a complete, finished unit with the metal forming a close bonded inlay in the plastic. One manufacturer makes a specialty of furnishing to the plastic fabricators decorative stampings in stainless steel for this very purpose. Perforated strips in coils are furnished for all sorts of decorative uses, one of which is for holders for flat glass dishes, trays, and similar articles.

The Gillette Safety Razor Co., Boston, is using a scheme of magnetizing blade steel after tempering, in order to set the temper. Apparently molecules under the influence of strong magnetic action become so disturbed and set that they do not readily return to an annealed or semi-annealed condition.

Many changes in style and usage of established products have resulted in markets for new materials. For instance, a demand for a speedier passenger train has caused engineers to turn to light-weight alloys and to streamlining. In typewriters an entirely new keyboard has been developed, which has altered the mechanical design and has led to the use of new materials. One typewriter manufacturer is using a single die casting for the entire body of the machine.

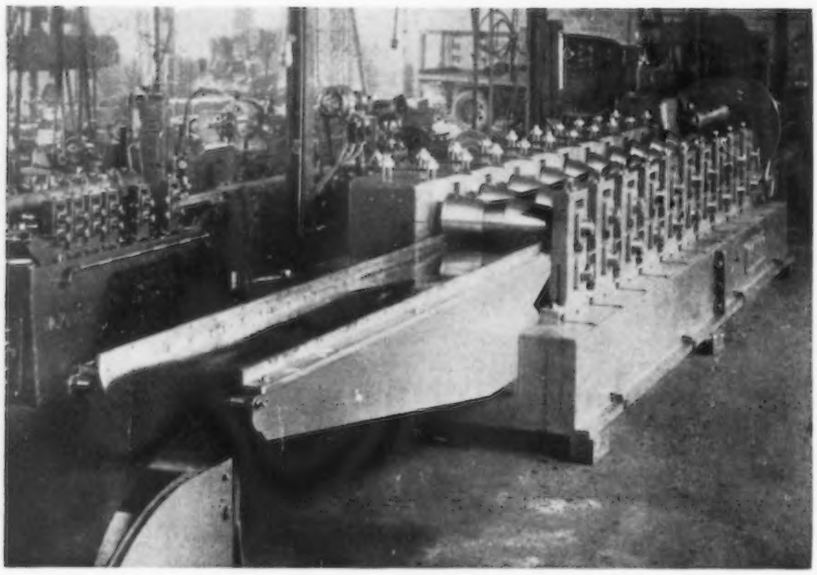
Production Technique Advances

SOME striking advances were made during 1933 in the technique of production of materials. The advances in powdered metallurgy are described elsewhere by Charles Hardy. The Firth-Sterling Steel Co., McKeesport, Pa., developed its winged ingot process of manufacturing tool steel. Many steel companies perfected the technique of producing stainless steel in all usual forms. The Steckel type of mill was successfully applied to hot rolling. A 4-high Steckel type mill was placed in operation at the Gary plant of the American Sheet & Tin Plate Co. for rolling strip. The product of this mill is heat treated and pickled in one continuous process. The mill was built by E. W. Bliss Co., Brooklyn. A machine was placed in operation for forming light structural steel shapes out of strip.

Tests have shown improved characteristics in steel when produced by the silico-manganese method developed by Dr. Charles H. Herty, Jr., metallurgical director, Carnegie Institute of Technology, Pittsburgh. In this method the silico-manganese alloy is used as a deoxidizer in the open hearth furnace.

Structural Steel Round Table

IN the realm of structural steel work, the tonnage in 1933 held even with that of 1932, but improvement in methods and materials was striking, and the ways were cleared for future progress. V. G. Iden, of the American Institute of Steel Construction, says in his report on conditions, "The rolling mills and fabricators for



This forming machine is used in making light structural steel forms out of strip by the Insulated Steel Construction Co.

the first time in history have come together around a table to completely standardize their structural shapes and engineering design details for the fabrication of structural steel. That alone is an achievement of the first water. But now that the preliminary work has been completed, the American Institute of Steel Construction plans early in 1934 to give the benefit to the public in a comprehensive revision of the standard handbook for steel construction."

Lower Inventories

THE striking improvement in speed of production processes has been turned to advantage in reducing inventories. This whole subject is tied up with the general economic situation, the improvement in transportation and distribution, and the practice of small-order buying all down the line. In one case a comparatively small manufacturer of steel barrels found that he could specify truck deliveries of sheets each morning, much as a housewife specifies the delivery of milk, with a negligible increase in price. In this particular case, the manufacturer actually receives order for steel barrels one day, calls up and orders his raw material for delivery the next morning, makes up the barrels and paints them during the day, and sends them to the purchaser by truck late that same afternoon.

High Tensile Stainless

DEFINITE results of work in steel research laboratories were more pronounced in 1933 than in 1932 and many entirely new alloys emerged from the experimental stage to become useful engineering materials.

Of particular importance during the year was the work in grain control and the stabilization of heat resisting analyses in the stainless steels. Several companies contributed to these developments. The Republic Steel Corpn., Youngstown, worked particularly with S.A.E. 3100 gear steel, but nevertheless reports its most outstanding accomplishment of the year to be the development of new high tensile stainless alloys through cold rolling and age hardening, and states: "We are now able to produce stainless strip with ultimate strength of 225,000 lb. per sq. in."

The American Rolling Mill Co., Middletown, Ohio, entered the stainless steel alloy field during the year with the production of sheets, strips, and plates. Two grades are available, one for automobile parts and the other for baking, laundry, and dairy machinery, and for beer barrels. The company has created a stainless steel sales department under the management of J. P. Butterfield.

The U. S. Steel Corpn., New York, reports the production of light strips and sheets in 18-8 alloy with tensile strength as high as 175,000 lb. per sq. in. This strength is obtained by a properly controlled amount of cold working. The material is particularly adaptable to the construction of light railway cars and automobile truck bodies and the report states that with this material, light sections can be built up to produce beams which are stronger and lighter than is possible to build with any of the non-ferrous alloys.

Titanium Additions

THE research laboratories of the Corporation perfected during the year a method whereby titanium additions are used to improve the properties of the standard 18-8 alloys. This has made available a stabilized austenitic alloy which is now produced in all of the usual forms. Its high affinity for carbon is said to prevent the formation of chromium carbides in the grain boundaries and thus to avoid intergranular attack.

A stainless clad steel produced by the Illinois Steel Co., Chicago, makes it possible to offer a material for welded construction having many of the advantages of stainless at a considerably lower cost. It is used for heavy tanks and vessels and is readily fabricated and welded with ordinary shop equipment.

The Page Steel and Wire Co., Monessen, Pa., took long strides in the application of stainless steel to many products during 1933. Outstanding was its successful drawing of flat and shaped wire forms in Allegheny metal.

Many new alloys for handling chemicals on a commercial scale have made possible chemical reactions never before attempted outside of the laboratory. The Haynes Stellite Co., New York, developed an alloy for handling sulphuric acid in all concentrations, and another of its alloys in the Hastelloy group has withstood tests under the action of hot and cold hydrochloric acid in all concentrations. Another alloy developed for handling hydrochloric acid is the high silicon molybdenum steel of the Duriron Co., Inc., Dayton, Ohio. This contains about 14 per cent silicon and from 4 to 7 per cent molybdenum.

The Age of Alloy Steels

ALLOY steels when properly employed in the design and construction of production apparatus tend to insure against interruptions of service. By use of certain alloys the dead-weight of machinery can be reduced. Chrome molybdenum, chrome nickel, and chrome vanadium steels are being used more and more where strength and lightness are important. Chrome molybdenum tubing, with its high strength to weight ratio, found extended use in the aircraft industry during 1933. Manganese steels have found new uses for railway switch frogs and for crusher and air hammer parts. It is the age of alloy steels and while the first cost is higher, in the long run the use of

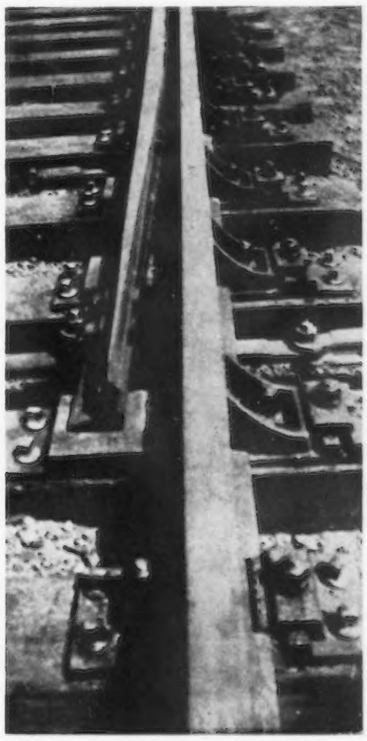
the proper alloy will nearly always prove an economy.

More interest in tantalum is expressed today on the part of steel companies than during the prosperous days of 1928 and 1929. The Ludlum Steel Co., Watervliet, N. Y., has found many new markets for its cold rolled silcrome strip. One important use is for cooking utensils as manufactured by the Corcoran-Brown Lamp Co., Cincinnati, Ohio.

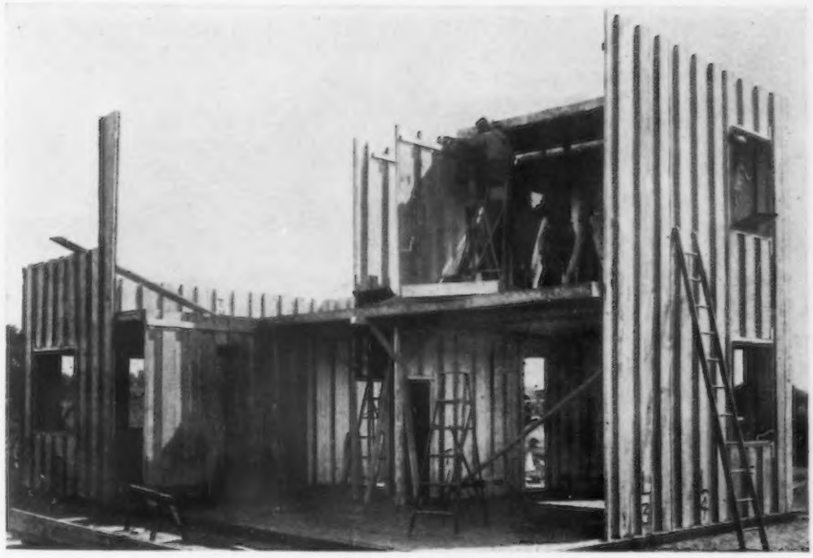
A silicon alloy anode has been developed by The Bullard Co., Bridgeport, Conn., as an addition to the art of metal descaling.

Tool Steels Are Improved

A NEW machinery steel developed during the year by Joseph T. Ryerson & Son, Inc., Chicago, is said to have about twice the strength of mild steel and yet to retain its free machining qualities. In its natural condition this new steel is designed for medium duty shafts, relatively soft gears, small machine parts, and tie rods. When heat treated to medium tensile strength it is designed for such parts as hydraulic press columns, punch press parts, drift pins, and jack screws. When heat treated to maximum hardness it is intended for hard gears, rollers, taper pins, cams, and wrenches.



Subsidiaries of the U. S. Steel Corpn. have developed new rail fastenings. This shows the right-hand rail point with the use of heel and gage plates.



A new type of light formed steel shapes to be used very much as lumber for house construction, was placed on a commercial basis in 1933 by the Insulated Steel Construction Co.

Uddeholm Steel Works, Sweden, developed an extra carbon tool steel which is said to be the highest grade of straight carbon water hardening tool steel made. The manufacturers state that it derives its superior qualities largely from the fact that it uses Swedish wrought charcoal iron. The steel is free from distortion and cracking when hardened and gives satisfaction on the most severe impact cutting and forming jobs such as cold heading dies, swedging dies, embossing dies, and punches and broaches.

The Multi Metal Wire Cloth Co., Inc., New York, reports the use of many new alloy wires in the construction of industrial screens. It has had initial success in experiments with nickel steel in the production of Fourdrinier wire in the paper industry.

What is thought to be the first push bench mill in the country was used by the Jones & Laughlin Steel Corpn., Pittsburgh, to produce a new line of hot rolled seamless steel boiler tubes. The mill has a forging action producing tubes with special ductility and good appearance. The surface is said to retard corrosion and to minimize depreciation of tubes in stock.

Bessemer Screw Stock

ANOTHER production of the Jones & Laughlin Steel Corpn. during 1933 was a Bessemer screw stock with improved machining properties. This has reference particularly to S.A.E. 1112, where the better machinability is said to have increased production, through automatic screw machines, in some cases by more than 50 per cent. The improvement was secured without change in chemistry or sacrifice of physical properties, but was the result of advances in manufacturing practice.

Leeds & Northrup Co., Philadelphia, describe unusual properties in oil hardening tool steel through the use of a new type of vapocarb rump furnace.

A new principle of rolling hot strip was put into practical operation by the Cold Metal Process Co., Youngstown, Ohio. This involved the application of the Steckel type mill to hot rolling.

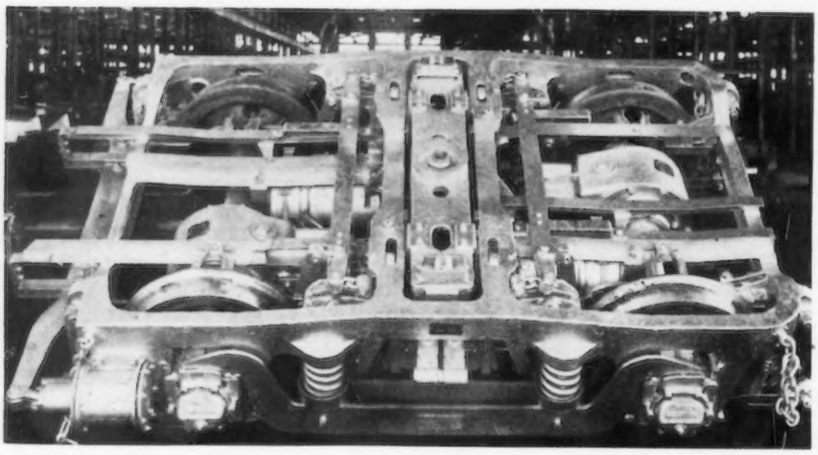
Electro-galvanized Wire

A SPECIAL type of electro-galvanized steel wire was developed during the year by the Bethlehem Steel Co. It is said to have a coating which is remarkably tight and ductile, and of exceptional purity. In addition, the process makes it possible to apply coatings considerably heavier than can be obtained with the hot dip method of galvanizing.

One of the important activities of the American Society for Testing Materials during the year was the preparation and adoption as standard of a grain size chart for the classification of steels. This marks the completion of work which has extended over a period of ten years. Another development in this field, reported by the Carnegie Steel Co., Pittsburgh, is the control of austenitic grain size in basic open hearth steel.

Fatigue of Steel

PROF. H. F. MOORE and H. B. Wishart of the University of Illinois developed a new fatigue test of



This is the new unit cast steel frame power truck as applied to the stainless steel train recently made for the Texas and Pacific Railway by Edward G. Budd Mfg. Co.

considerable significance. Heretofore it has been difficult to test for fatigue because of the long time required to make a determination. In the new tests the specimens are run over night on a rotating beam fatigue machine and are then tested in tension. The theory of the test is that repeated flexure increases the strength by cold work up to the endurance limit and that above the endurance limit cracks develop which reduce the tensile strength.

This greater care in testing of steels was certainly one of the features of progress in 1933. The Union Drawn Steel Co., Massillon, Ohio, introduced a process of magnetically testing steel bars, and many other companies extended testing and inspection technique.

Corrosion Resistant Finishes

STEEL continues to be the basic structural material in our rapidly developing arts and industries, and with its expansion there follows a persistent demand for protective coverings. During 1933 some of the difficulties in electro-plating practice stimulated research, and improvement of the progress and prospects in the plating field are reported in the following statement made for THE IRON AGE by Dr. Colin G. Fink, head of the Division of Electro-chemistry, Columbia University, New York:

"In the improvement of plating technique, heat treating methods have been especially successful and in particular, heat treating in a reducing atmosphere. Thus highly corrosion-resistant steel sheets have been produced by first nickel plating or nickel and chromium plating or chromium plating alone, and subsequently heat treating. In the course of this work it was discovered that heat treating in hydrogen, even without the plate, resulted in increased resistance to corrosion of the steel surface.

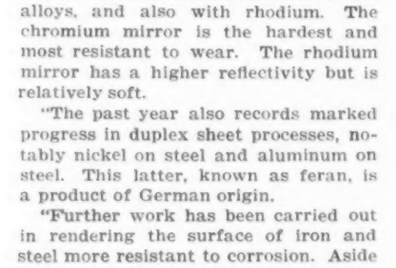
"The whitest deposits are obtained from an electro-deposited alloy of cobalt nickel followed by a very short heat treatment. The product's resistance to corrosion approaches that of the chromium alloys. The cobalt nickel alloy deposit has given satisfactory results on a commercial scale. Next to highly polished silver it is the whitest plate.

"For absolutely plane-parallel mirrors the cobalt tungsten steels of the stellite type have been found to be most suitable. These mirror bases have been plated with chromium and cobalt nickel alloys, and also with rhodium. The chromium mirror is the hardest and most resistant to wear. The rhodium mirror has a higher reflectivity but is relatively soft.

"The past year also records marked progress in duplex sheet processes, notably nickel on steel and aluminum on steel. This latter, known as feran, is a product of German origin.

"Further work has been carried out in rendering the surface of iron and steel more resistant to corrosion. Aside from the work mentioned above, reference should also be made to the heat treatments in a dilute atmosphere of chlorine. The action here appears to be similar to that of treating in chromic acid—equipotentialization of the surface, thereby eliminating the local galvanic couples most frequently responsible for starting corrosion.

"The outlook for 1934 is most encouraging. We are looking forward, in particular, to methods of coloring steel products, the colored film not only adding to the attractive appearance of the product, but primarily rendering the surface resistant to corrosion. Preliminary work along this line offers much promise."



Heavy hydraulic presses and carefully designed dies are used at the Lake City Malleable Co., Cleveland, for producing this threaded part within limitations as close as 0.003 to 0.005 in.

Asphalted Steel

COLD rolled steel with a pure nickel bonded finish has been added to the line of bonded products of the American Nickeloid Co., Peru, Ill. The new sheets are furnished highly polished and intended primarily for the manufacture of vanity case mirrors.

Another company to develop special coatings for steel sheets is the H. H. Robertson Co., Pittsburgh. This company reports the following system: A layer of asphalt to resist both extreme heat and cold, over this a layer of asbestos felt impregnated with asphaltic oils, and on top of this a further layer of corrosion- and weather-resistant asphalt. Another new product of this company has an outer coating consisting of a sprayed ceramic material giving a hard unusual texture furnished in three standard colors. This is intended primarily for decorative and architectural uses.

Better Tin Plate

A DISTINCT advance was made in the manufacture of tin plate under the cold reduction method to produce a sheet with unusual deep stamping properties. Another development is that of greater uniformity of gage with respect to the edge and middle of tin sheets, a property demanded by the metal forming and drawing industry.

Some plants are depositing bright nickel coatings on cold rolled sheet stock in order to avoid the usual buffing operation after nickel plating, and unusual applications of cadmium coating for rust prevention were made during the year. The Burgess Battery Co., Chicago, has been successful in producing products made of terne plate to which is applied a baked black enamel to protect the metal against gasoline fumes. Lukens Steel Co., Coatesville, Pa., extended the use of its nickel clad steel plate.

Flat Steel Floors

STRUCTURAL steel activity during 1933 involved many interesting features, according to V. G. Iden of the American Institute of Steel Construction. He states that the Sunnyvale hangar built for the Navy in California has the largest clear floor space of any structure heretofore built and is a monument to the possibilities of steel. Furthermore, it

includes 22,000 sq. ft. of flat steel plate floors, a type of construction aggressively developed only within the past year or two. Mr. Iden continues:

"Speaking of steel floors, the H. H. Robertson Co. has during the past year sold its particular type of steel floor to 105 projects, while the Belmont Iron Works has also reported success with its type of steel floor. With but a slight upturn in business the steel floor should rapidly come into greater prominence and work an important reformation in construction.

"The Skyride at Chicago was an unusual structure involving balanced counterweight anchorages making possible a constant tension in the crossing cables. The Chicago Fair enabled structural steel engineers to try out other innovations in steel building, particularly in the realm of small buildings.

"For the Golden Gate Bridge which is now under construction it has been necessary to go 100 ft. below the surface of the swift running water for the tower foundations. This stupendous bridge enterprise will include every type of bridge span ever designed.

"Other important developments in structural steel include special linings up to 2 in. thick, in large steel penstock pipe. The steel walls and ceilings in the new Toronto, Hamilton and Buffalo Railway Station at Hamilton, Ontario, involved new methods of fabrication and welding enabling the builders to obtain strikingly smooth surfaces without seams or visible joints."

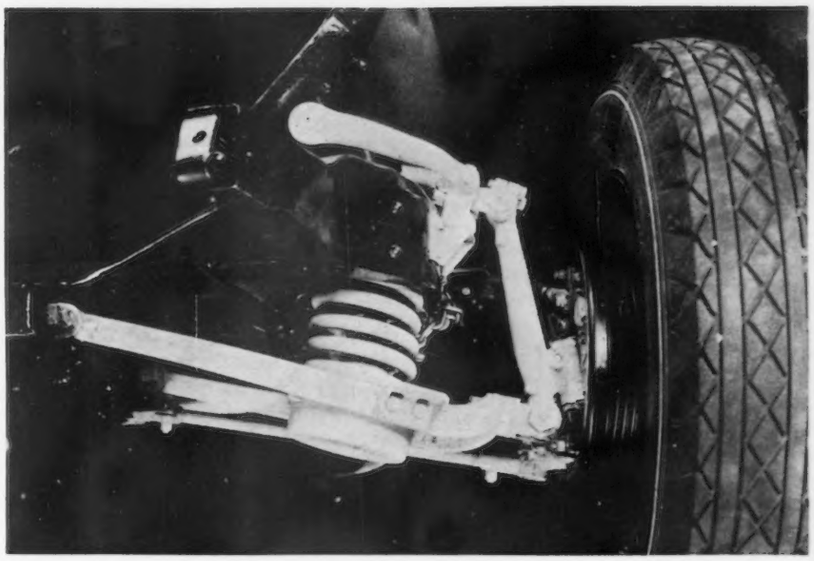
Frameless Steel Construction

THE past year marked the beginning of the commercial production of so-called frameless steel as a building material. This method, sponsored by the Insulated Steel Construction Co., Cleveland, gives a simple and inexpensive metal shell or chassis for residences and light commercial buildings. It is also used for floor members and roof decking for a great variety of structures. By this method cellular construction replaces the conventional studs, joists, and rafters. All standard interior and exterior finishes may be used with it, and because of the thinness of floors and walls, interior areas are increased as against standard construction. The material is supplied either in factory assembled units or in standard shapes.

The extension of rolled steel products into new fields is reported by the American Sheet & Tin Plate Co., Pittsburgh. An interesting example is the designing and building of a welded steel housing for an 84-in. 4-high cold rolling mill.

For the purpose of investigating the demand for steel in residence construction, a survey was undertaken by representatives of the subsidiary companies of the U. S. Steel Corpn. Nearly 100 different systems of construction were studied and several residences were built as part of the investigation. The conclusions were:

1. There exists a widespread interest in steel framed residences. The principal demand is for small one and two family houses of individual design.
2. Steel can be advantageously used in the construction of residences of any architectural style or arrangement to provide a frame that will not shrink, is inherently non-combustible, sanitary and rigid, resists the destructive attack of insects, and can readily be made permanent.
3. Certain new practices can be employed with safety and economy in the design of the steel framework for small residences along lines not contemplated in current engineering handbooks.
4. With the aid of suitable information the steel framework can be designed by architects as readily as in the case of older forms of construction.
5. The details of the steelwork can be developed to advantage in cooperation with the personnel of a fabricating shop located in the vicinity of each job.
6. The fabrication and erection requirements are simple and are well suited to the equipment of the smaller structural or sheet metal shops.

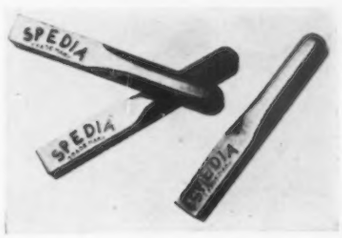


This unique scheme of individual spring suspension for the 1934 Plymouth has been made possible by the high strength properties of the new steels and alloys.

Standardized Shapes

DURING 1933 all of the American manufacturers of steel sheet piling collaborated to produce a new series in which sections are interchangeable with respect to weights, dimensions, and strengths. The makers of wide flange beams likewise collaborated in producing a uniform series of beams, girders, and columns. This is an important development as it covers the field more effectively than ever before, with fewer sections and fewer weights, greatly simplifying design and reducing inventory.

A report of tests of steel piles, made by the State of Nebraska, covering a period of 35 years, is of particular interest as it shows an average loss of metal of but one per cent in 20 years in fresh water and two to two and one-half per cent in 20 years in Salt Creek Valley. As a result of the tests, the State of Nebraska is now using an average of over 500 tons of steel piling a year.



For retouching tool set-ups, new hand laps are made, having diamond dust molded into the outer layer of bakelite.

Road Steel

THE program of construction under the National Industrial Recovery Act involves a large amount of steel in the reinforcement of concrete for road surfaces and bridges and in bridge structures. H. S. Fairbank of the Bureau of Public Roads states that the program now being put under way involves a greater demand for steel than any expenditure of a similar amount of money hitherto made under a road improvement program.

An important change in the requirements for concrete reinforcing steel was made during the year. This involved the weight tolerance requirements because it was found inadequate and inequitable both to consumers and producers to operate on the tolerances divided unequally be-

tween over and under variations from the specified or theoretical weights. Specifications were prepared covering uniform under and over weight variations. These call for a variation of not more than 3½ per cent from the theoretical.

Alloy Castings in Demand

A MORE insistent demand for close grained castings in 1933 was apparent throughout the foundry industry. Close grained gray iron has been developed for machine slides and to reduce the absorption of oils and liquids in many other applications. In order to meet a strong demand for standard requirements the American Society for Testing Materials approved specifications covering alloy steel castings for structural processes. This is for cases where mechanical stress and not high temperature is the determining factor. The required minimum tensile strength ranges from 75,000 lb. to 150,000 lb. per sq. in.

The Blaw-Knox Co., Pittsburgh, reports an increase in the use of alloy castings in the process industries, particularly in the paper, textile, rubber, and oil industries.

A scheme for recuperation for air furnace work in foundries was one of the features of the year, according to Enrique Touceda, consulting engineer, Malleable Iron Research Institute, Cleveland, who continues with the following statement covering the malleable field:

> "Because customers have demanded more prompt deliveries, most malleable plants have taken steps to expedite the annealing time. A number of foundries have installed car type ovens for this purpose. Some confusion exists as to the use of the short anneal to produce a high tensile product. Some incorrectly think that castings thus produced differ from true malleable in structure. It should be understood that the short annealing cycle is just as applicable for the manufacture of malleable iron as are the much longer cycles used in the periodic or other type of anneal ovens, and that the short anneal has reference solely to the cycle used and not to the product made."

A standard definition of malleable iron is needed, according to several authorities. One group of alloy irons produced in malleable foundries by so-called shock anneal has characteristics similar to steel, while some other products of the malleable foundry are closer to cast iron.

Alloy Malleable

THE whole malleable industry is expanding to include a constantly increasing line of alloy irons and a changed technique of anneal results in castings which differ in composition, in structure, in tensile properties, and in machinability, from the product generally recognized under the definition of malleable iron.

H. P. Blumenauer, president, Arcade Malleable Iron Co., Worcester, Mass., in reviewing progress in 1933 states that the last half of the year showed a decided improvement over the first half and this applies particularly to alloy malleable castings. He feels that the general sentiment and mutual understanding within the industry is more wholesome than in the past and a frank exchange of technical information and foundry procedure is proving an advantage to the industry as a whole.

Rebecca Hall, consulting metallurgist, Chicago, states that recently some of the malleable iron foundrymen have turned to research for the production of special metals with a malleable iron base. In the years to come, she says, we may expect to see the rise of an entirely new class of irons built from a malleable base by the use of alloys with highly specialized properties, each designed to meet a particular problem in service.

Chromium Castings

THE Electro Metallurgical Co., New York, had success with high chromium cast irons and cast steels for use at elevated temperatures. The physical properties of these castings have been found to be greatly improved by nitrogen added in the form of high nitrogen ferrochrome. Such additions have proved effective in reducing grain size and improving the strength and toughness of steel castings containing 20 per cent or more of chromium. Another important effect of nitrogen is its tendency to retard development of brittleness in the wrought low carbon steels containing over 20 per cent chromium. The introduction of nitrogen to the chromium nickel steels produces castings having relatively high strength without appreciable lowering of ductility.

Chromium cast irons containing from 12 to 35 per cent chromium are rapidly replacing ordinary gray iron and white iron castings for service at elevated temperatures because they resist heat, oxidation and abrasion, and are free from growth. These alloy irons are free from growth at temperatures up to 1800 deg. F. and are protected against oxidation by the formation of a thin, very adherent scale. High chromium cast irons are particularly adapted for such parts as furnace door frames, grate bars, door castings, conveyor parts and stoker links. In one installation 14 per cent chrome stoker links have been in service for more than a year and show absolutely no signs of wear or oxidation and are in as perfect condition as when installed.

The Chicago Steel Foundry Co. describes an increase in the sale of its cast steel screw conveyors and that many improvements in technique have been made in this connection. One field of activity of this company is the use of alloy steel castings in cement mills. Recently these materials have been extended to the railroad equipment field.

Symposium on Cast Iron

THE U. S. Pipe & Foundry Co., Burlington, N. J., further improved its process of centrifugal casting of pipe by the De Lavaud method. Detailed announcements in this connection are to be made early in the new year.

According to Arthur D. Little, Inc., Cambridge, Mass., cast iron with properties comparable to those of malleable iron and steel castings, but at lower cost, can now be produced by means of close technical control, better heat treatment, a certain amount of alloying, and improved casting practices such as centrifugal casting.

The American Society for Testing Materials reports one of the events

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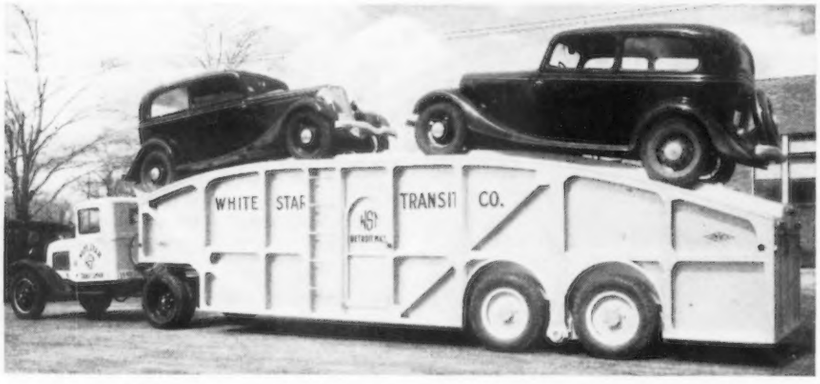
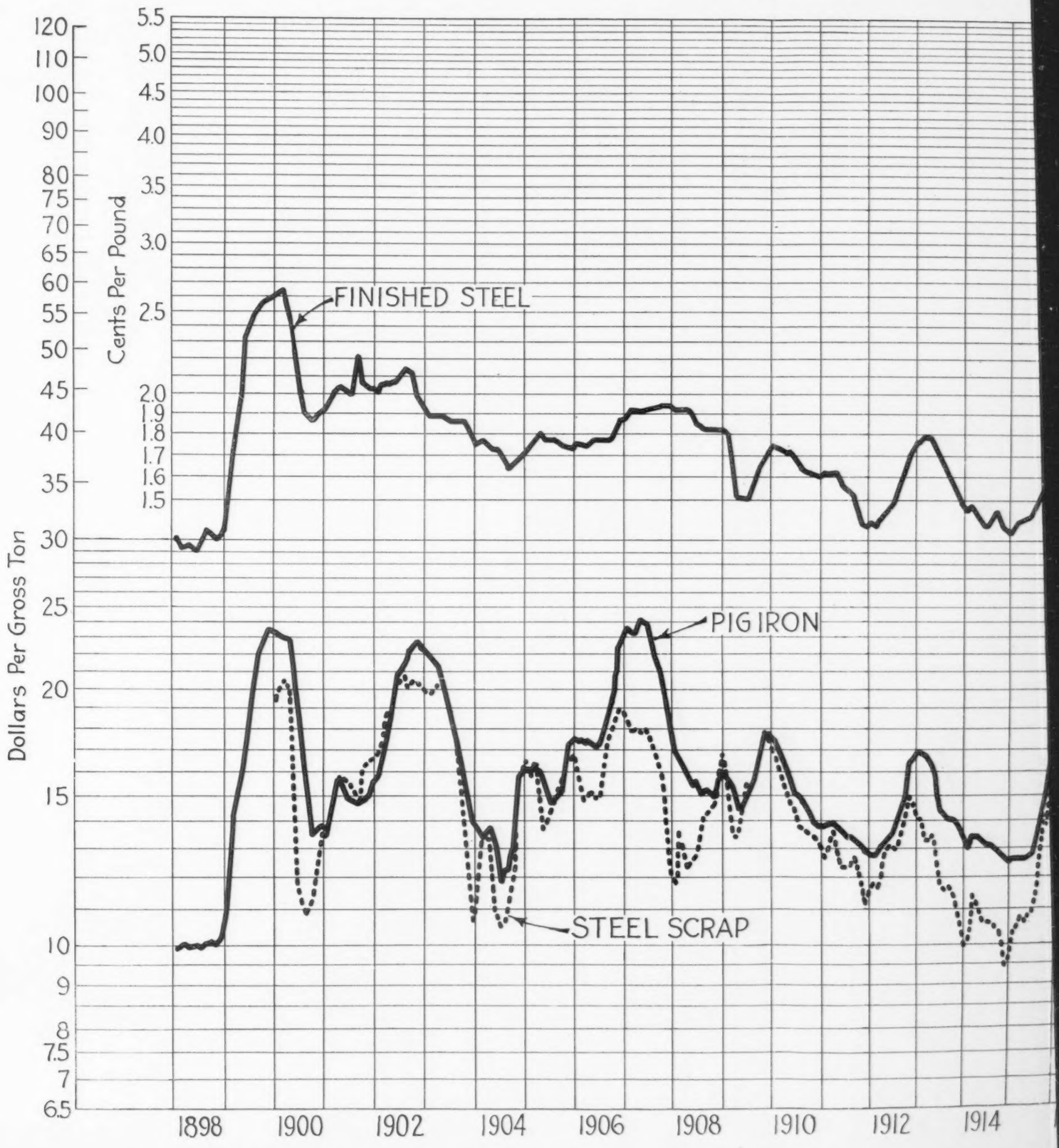


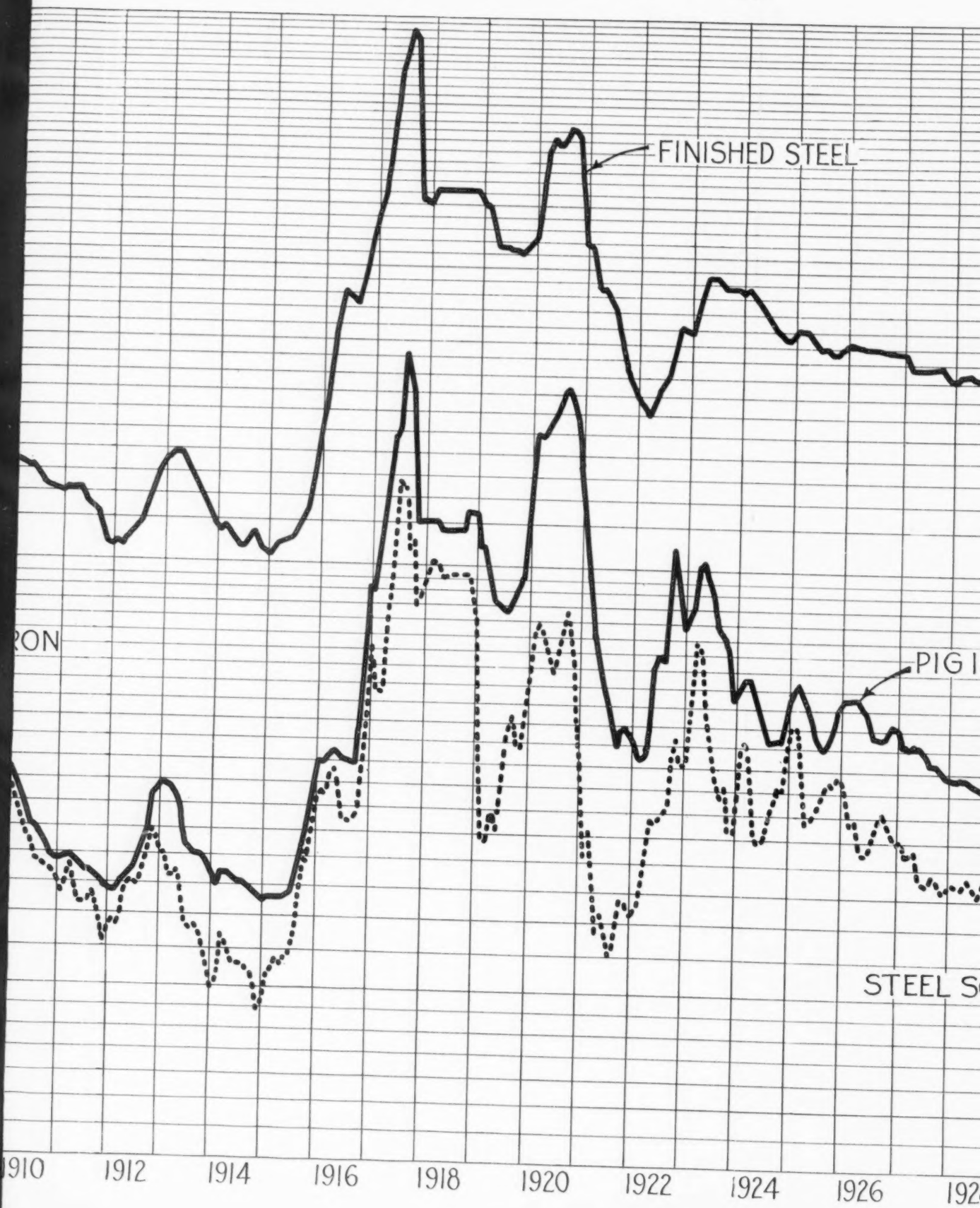
This auto transportation trailer is made of the magnesia alloy Dowmetal.

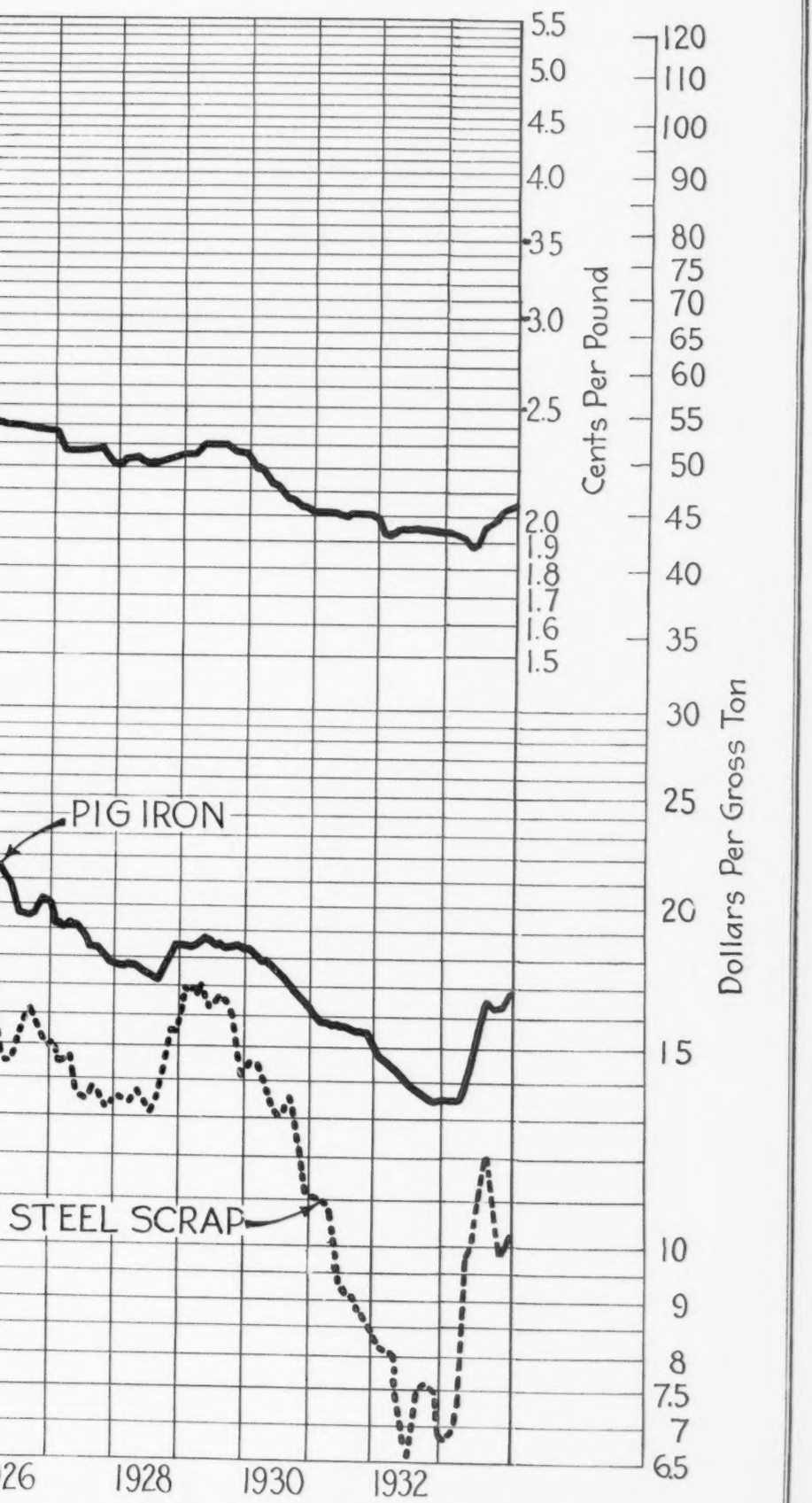
Composite Price



Like vertical distances anywhere on the chart represent equal percentage changes; accordingly, parallel slant lines anywhere on the chart represent equal rates of change.

oosite Prices of The Iron Age




5.5
5.0
4.5
4.0
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3.0
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2.0
1.9
1.8
1.7
1.6
1.5
Cents Per Pound
120
110
100
90
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
9
8
7.5
7
6.5
Dollars Per Gross Ton
PIG IRON
STEEL SCRAP
1926
1928
1930
1932

(*Continued from Page 74*)

of value during the year was the publishing of a symposium on cast iron. This was the third report of a series sponsored by the Society and the American Foundrymen's Association, of which the report on malleable iron in 1931 was the first and a report on steel castings in 1932 was the second.

The American Cast Iron Pipe Co., Birmingham, Ala., in cooperation with the American Society for Testing Materials, has carried on extensive tests on the physical properties of cast iron, and many interesting conclusions from these tests are to be published shortly.

Hard Surface Castings

A PROCESS called electriding, which consists in converting the surface structure of malleable or gray iron castings into a hard carbide structure, has been developed by the Gunite Foundries Corpn., Rockford, Ill. The feature of the process is obtaining a Brinell hardness of from 350 to 375 to depths of 1/16 to ⅛ in. without changing or destroying the structure of the casting directly underneath the hardened area. The company reports that four railroads are now using electrided malleable brake heads.

The consumption of nickel in cast iron in 1933 was more than 55 per cent above that for 1932, and many new nickel alloy castings are described in a statement made by the International Nickel Co. of Canada. According to this report, the past year saw the universal adoption of heat treated nickel chromium cast iron dies for automobile bodies. Another important development was the extended production of a nickel chromium type of malleable cast iron extensively used for locomotive grate bars. Alloy cast iron up to three per cent nickel has been introduced for brake drums.

The past year witnessed the establishment of chilled rolls for cold rolling of sheet metals, made of a nickel chromium alloy white iron.

Metallic calcium has been used successfully as a deoxidizing agent for iron castings. Calcium treated cast irons are said to have a more uniform grain structure than untreated material.

Forgings Are Improved

THE Illinois Steel Co. developed an alloy designed to give high physical properties in forgings without quenching. This alloy containing 0.35 to 0.4 carbon and manganese, chrome, and vanadium has been used for automobile crank shafts and in the water quenched condition is expected to have extended use for such parts as connecting rods, axles, and drive shafts.

"THE structural steel industry looks forward with confidence to 1934," states V. G. Iden of the American Institute of Steel Construction. "It may not carry us back to previous prosperous peaks but it will certainly prove much better than 1932 or 1933, and the tonnage involved will probably equal the 1931 volume."

Trends in automotive design are of vital importance to the drop forging industry and this year's swing to independent front wheel suspension is therefore significant. In general, front axles are drop forged, one end at a time, under heavy hammers. It now appears that the types of independent suspension considered by automobile manufacturers for the 1934 models, instead of using an axle will have other forgings which will fully compensate for the loss of the axles.

An interesting thought not only for the forging industry but for others supplying the automotive field is that if we are to have as many automobiles in this country on Jan. 1, 1940, as we had on Jan. 1, 1930, the average automobile production from now until 1940 must be as great as it was in 1929.

Aluminum Popular in England

DURING the past year aluminum fully maintained its prominent place among metals in industry. The British Aluminium Co., Ltd., New York, reports that in the construction of the Daily Express office building, London, exterior strips of aluminum alloy were used and that in the interior of the building much aluminum alloy was used for the fittings and decorations. The report continues:

"The use of gas lighting is still widespread in England, and aluminum is popular for the fittings and fixtures, as it has greater resistance to sulphur fumes than some of the other metals used. In the electrical industries the use of aluminum transmission lines and bus bars continues to increase. Aluminum pistons are used in Diesel engines, and aluminum truck bodies are now being built in great numbers. One line of cars uses aluminum steering gear. In the brewery trade aluminum fermenting tanks are used. In fact more than half the beer made in England is now fermented in aluminum, and aluminum beer barrels have come into use during the past year."

New Aluminum Fields in U. S.

A COMPREHENSIVE review of the aluminum industry in this country has been prepared by I. W. Wilson, vice-president, Aluminum Company of America, Pittsburgh. In this he speaks of the upward swing of materials during 1933. He says that new ideas and new materials have been the rule rather than the exception and that in many of these developments, aluminum has played an important part. Continuing, he says:

"Following the practice in Europe, aluminum is finding wide acceptance in our recently reopened breweries. During the year it has been used for such equipment as wort coolers, fermenting vats, yeast utensils, storage tanks, and dispensing coils. The construction of aluminum beer barrels has been started and aluminum alloys have been developed which combine the nontoxicity of pure aluminum with satisfactory strength and lower cost.

"The increasing popularity of aluminum foil caps for milk bottles and other food containers gives high hope for an ultimate heavy tonnage in this direction. Dairies started using aluminum foil caps in 1932, but this year brought a new design which crimps around the neck of the bottle and which is available in colors.

"In the architectural field the Cincinnati Union Terminal affords an example of the trend. Here aluminum was used for the entrance trim, bulletin boards, radiators, vestibules, light fixtures, and stair railings.

"A new method of oxide coating and coloring aluminum has come into practical use during the year. In the transportation field the use of new extruded shapes is a feature. An all-welded aluminum dump truck body offers some attractive possibilities.

"In no year in the history of railroad transportation have developments occurred with such startling rapidity as in 1933. Two all-aluminum Pullman cars exhibited at Chicago weighed only half as much as the previous type of construction.

"An interesting engineering feat was the completion during the past year of the work of rebuilding the Smithfield Street Bridge at Pittsburgh. In this bridge, aluminum alloy structural shapes and plates were used for the entire floor, resulting in a reduction in dead load of approximately 750 tons on the trusses. Engineers state that

this use of aluminum will prolong the useful life of the existing steel structure by at least 25 years. Aluminum used for this bridge was in the form of a new alloy developed during the year. At least two other important aluminum alloys were developed in 1933."

Hazelett Metals, Inc., New York, reports substantial progress in rolling aluminum strips direct from the molten metal. This same process is being tried experimentally with considerable success in the production of other non-ferrous metal forms.

Copper Alloys

ELECTRIC welding of refinery copper was placed on a commercial basis for the first time during 1933, according to a report of the American Brass Co., Waterbury, Conn. Welds having the strength of annealed copper, with good ductility, are reported. Distillery equipment has been made of copper with this type of welding which employs a high tin phosphor bronze welding rod.

A greater tonnage of Everdur was produced in 1933 than in 1932. This is a copper manganese silicon alloy and is used extensively for hot water tanks and range boilers. It is also used for brew kettles, heat exchanger apparatus, and for storing liquefied gases at the temperature of liquid air.

Seamless tubes of everdur have invaded the electrical conduit field. It is particularly applicable wherever the threat of corrosion renders previous types of conduit unsatisfactory.

The Blaw-Knox Co. was one of those to perfect a method of copper welding during the year.

Artificial Patina

SEVERAL interesting finishes for copper have appeared. One of these is an artificial patina which is said to closely resemble the natural patina which it often takes copper ten years to acquire.

Another finish is known as crystalcote. This is a pliable coating which will not crack under considerable bending and which closely resembles a vitreous enamel finish.

The American Nickeloid Co. has extended the use of its chrome copper. This is a material having a cold rolled copper base on which a pure chromium surface is deposited. It is used among other things for coffee urns. Similar products of this company are nickel plated copper, chrome plated brass, and nickel plated brass.

The Riverside Metal Co., Riverside, N. J., during the year developed a method of producing a beryllium copper in sheets, wire rod, bars, and strip.

Two 1933 products reported by Revere Copper and Brass, Inc., New York, are herculoy, a new bronze, supplied in cold rolled sheets, with a tensile strength of 85,000 lb. per sq. in. and an elongation of 30 per cent; and a new bronze welding rod.

I. M. Wilson, vice-president, Aluminum Co. of America.

Trouble in high tension cable is usually due to defects in the lead sheath. In order to remedy this, the General Electric Co. developed a special lead press by which a seamless sheath is produced. With this press the lead stream is not separated as with the older type and thus welds and danger of weak spots are eliminated.

Nickel Use Expands

THE extension in the use of nickel steels and other nickel alloys is indicated by consumption statistics. For the first 10 months of 1933 more than 77,000,000 lb. of nickel were used in the world, as against less than 50,000,000 lb. in the same period of 1932. A statement by Robert C. Stanley, president, International Nickel Co. of Canada, Ltd., covering the progress in the nickel industry in 1933, describes many interesting new alloys and the modification and extension of nickel alloys developed previous to 1933. The report states:

"Improvements in the fabrication of nickel clad steel plate have added to its acceptance in new fields. A recent application is that of steam locomotive fire boxes.

"Some of the new uses for chrome nickel known as inconel include sheathing for surface heating units in electric stoves, wire for screens for various purposes including window screens, exhaust manifolds for aircraft engines, mixing and storage tanks in distilleries, and such widely divergent uses as table flatwear and costume jewelry.

Improvement of Nickel Plating

"The new process of nickel plating by which bright deposits may be plated rapidly and to relatively great thickness, gave a great impetus to commercial nickel plating. When technique is correct in nickel plating over well polished metal, the final buffing is frequently eliminated. Sales of nickel welding rod increased nearly 50 per cent during 1933 as against 1932.

"During the past year an effort was made to take advantage of the many delicate colors and unique tints available in the transition from nickel to copper in the nickel copper alloys. These include pink, tan, salmon, lemon, green, blue, and purple, and for the first time in history these colors have been correlated with the alloy compositions and with identification charts prepared for architects."

Tantalum Aids Deep Drawing

DISTINCT advances were made in 1933 in the preparation of tantalum sheet for deep drawing and expanding stock, according to a report of Fan-steel Products Co., Inc., North Chicago, Ill. A technique has been developed for hardening tantalum by gas absorption and the metal can now be welded in nearly all forms. Tantalum carbide cutting tools have been produced to meet practically all machining requirements. The advantage stated for this material is that it imparts a non-cratering characteristic to the tool.

Zinc Alloys

THE main development in the field of zinc fabrication during 1933 was the introduction of a new rolled zinc alloy sheet with the particular stiffness most desired by weatherstrippers. Estimates of the New Jersey Zinc Co., New York, place the amount of high grade zinc used for die castings in 1933 at close to 25,000 tons as against 17,000 for 1932. This same company states that the tonnages of zinc used for galvanizing and for brass making in 1933 will be greatly in excess of the 1932 totals.

The American Society for Testing Materials during the year adopted its second tentative specification covering a zinc die casting alloy. This approved alloy, according to the New Jersey Zinc Co., corresponds to Zamak No. 3 alloy.

The use of metallic calcium to improve both iron and zinc and other metals was described in detail during the year by C. L. Mantell, Pratt Institute, Brooklyn, and Charles Hardy, Hardy Metallurgical Co., New York.

A new nickel plating process was developed by the Pyrene Mfg. Co., Newark. This process uses high current density and is said to produce brilliant nickel deposits of any thickness. The company claims that subsequent polishing is entirely eliminated, whether chromium is applied over the nickel or not. The com-

pany also claims that due to the peculiar crystal structure the throw of subsequent chromium plating is increased.

Magnesium Alloys in 1933

IN a report by the Dow Chemical Co., Midland, Mich., covering recent developments in magnesium alloys, the new commercial forms including castings, plate, sheets, and structural shapes are mentioned. The company's alloy, Dowmetal, is now available in sheets and plates up to 20 ft. in length and four ft. in width, and in structural shapes in sizes up to 6-in. I-beams. Die castings of dowmetal have been produced in sizes up to 18 in. in length. The main demand for die castings has been in the field of portable tools and office equipment. Truck bodies and trailers made largely of Dowmetal have been brought out by several manufacturers. The 7-ft. gondola used in the successful Settle-Fordney stratosphere flight was made of Dowmetal. The company reports that consumption of its alloy increased by more than 100 per cent in 1933.

The time for annealing silver and gold was cut from 2 h. to 6 min. during the year by the use of a lavite bath and an internally heated furnace, according to a report of the Bellis Heat Treating Co., Branford, Conn. By the same process it is said that the time of annealing aluminum was reduced from 24 hr. to 15 min. The heat is electrically generated by the resistance to the current of the salt bath heating medium.

Many new applications in the use of molybdenum during the year are reported by the Molybdenum Corpn. of America, Pittsburgh.

OUR efforts in 1933 were directed toward standardization of materials from the long list of those now available. At the same time we have been careful to scrutinize all new products, as we do not want to be handicapped by any rigid policy."

C. H. Champlain, general works manager, Westinghouse Electric & Manufacturing Co.

Cemented Carbides

NEW methods of supplying users with cemented carbide tools are described in a report of progress prepared by the Carboloy Co., Inc., Detroit. Material under the following four classifications has been made available:

1. Finished tools.
2. Milled and brazed tools.
3. Tools brazed only.
4. Raw blanks.

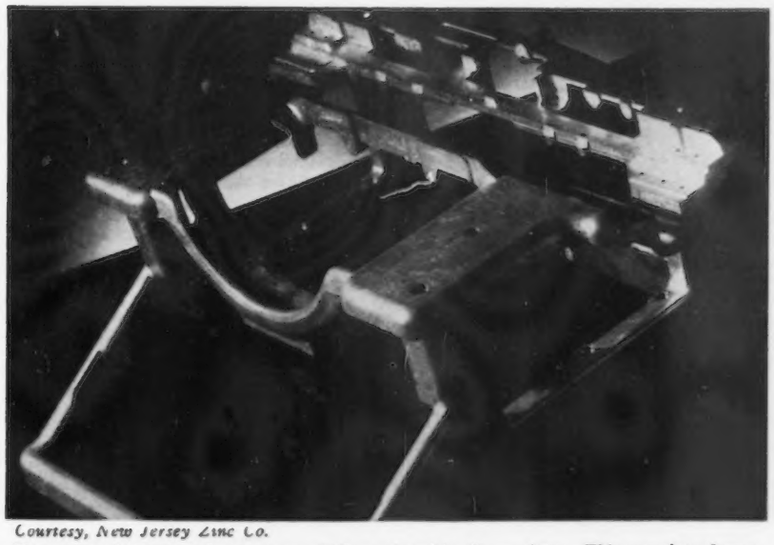
Some users have found it an economy to install special equipment for producing their own tools and then purchasing the cemented carbide in the form of blanks. This appreciably reduces the investment in reserve stock. Development of special grades of cemented carbide was necessary under the severe performance demands of the hand-to-mouth buying. The Carboloy Co. during 1933 experimented with tungsten carbide, tantalum carbide, titanium carbide, and with combinations of these and other types. One of the new alloys has just been released to the commercial field.

Die Castings

OUTSTANDING developments took place during 1933 in the die casting industry. Alloy steels, including even the difficult stainless steel group, were successfully die cast in the laboratory. The Alan Wood Steel Co., Conshohocken, Pa., put a large automatic die casting machine in commercial operation on the production of cast iron soil pipe. Several other cases of practical die casting of iron have been reported. One company is now successfully making camshafts by this method. The Titan Metal Mfg. Co., Bellefonte, Pa., completed during 1933 its method of making brass pressure castings, stating that more than 1,000,000 such castings were made before the process was labeled an economic addition to the metal fabricating arts. The Aurora Metal Co., Aurora, Ill., developed and commercially standardized a vacuum method of producing aluminum bronze die castings. The Lester Die and Machine Co., Cleveland, Ohio, developed a process of solid pressure casting of non-ferrous metals said to combine the advantages of die casting and forging.

Many new alloys for die casting aided in the development work of the machine and process designers. One new hard zinc die casting alloy was added to the list of the American Society for Testing Materials. This alloy when used for typewriter parts withstood all of the usual tests for malleable iron castings. Automobile windshield cowls for the first time have been die cast in one piece with a saving of about 30 per cent over the previous method.

A new coating material known as bonis, for use on dies in the production of aluminum and brass die castings, was brought out during the year by the St. John X-ray Service Corpn., New York. It is said to give longer life to the dies and to produce a smooth finish on the castings.



Courtesy, New Jersey Zinc Co.

Typewriter frames are being successfully produced in die castings. This complete frame consists of two castings

Metal Stampings

SPURRED on by the competition of other fabricating methods the stamping, punching, and forming shops developed short cuts in the manufacture of dies and reached out into

new fields for auxiliary processes. Improvement in punch press design and application is described elsewhere, but a report of the Thomas Smith Co., Worcester, Mass., is typical of the trend in jobbing stamping shops. The company states that this year for the first time it has solicited gas cutting on a jobbing basis either separately or in conjunction with stamping operations. Some other jobbing companies have paid particular attention to welding and flame machining.

Transportation and Transmission

OUTSTANDING developments in the field of transportation include a 3-car train for the Union Pacific System made entirely of aluminum alloys and weighing about 80 tons, which is less than the weight of one ordinary all-steel Pullman sleeping car. The train is tubular in shape, is streamlined, and is powered by a 600 h.p. internal combustion engine. A 2-car light weight stainless steel train was designed and built along original lines for the Texas and Pacific Railway by Edward G. Budd Mfg. Co., Philadelphia. The U. S. Steel Corpn. devoted much attention during the year to the development of safer track structures to take care of the increasing speeds and loads of modern traffic. One design consists of a wide, heavy rolled steel plate with high solid ribs parallel to the rail base, the space between the ribs forming the rail seat. The Illinois Steel Co. reported completion of a process of thermal treatment of steel rails, consisting of normalizing and hardening at the ends of the rails to prevent battering.

The hard facing of automotive exhaust valves and valve seats was one of the 1933 developments of the Haynes Stellite Co., which company states that after runs as high as 150,000 miles no regrinding or refinishing of the seats was necessary. This is remarkable in view of the fact that ordinary cast iron seats have a life of about 10,000 miles between grinds.

In the field of aviation the General Electric Co. reports that commercial lines in this country made the astonishing jump in speed from two miles a minute to three miles a minute. This was made possible by increased engine power due to supercharging and the use of lighter and stronger materials both for the engine parts and the plane bodies. General Motors Corpn., Detroit, reports as a development of 1933 the knee action wheels which will be used on 1934 cars. This new type of design on many makes of car will cause some extended shifting of materials and processes.

New types of shock absorbers for both automobiles and trucks were developed by the Spicer Mfg. Co., Toledo, Ohio. This company states that its 1934 production of axles will probably exceed any former production in its history, as this product is now standard equipment on many of the popular cars.

The American Bridge Co., New York, developed a new transmission tower known as a rotated type of tower, which is characterized by low compression and uplift reactions at the axles. Because of this feature it is said that there is a marked reduction in material cost. The tower was adopted for the transmission line now under construction between Boulder Dam and Los Angeles, which line will have the greatest single mileage and the highest operating voltage.

Products and Machine Elements

AMONG the thousands of new products appearing in 1933, the following list has been selected as typical:

Henry Disston & Sons, Inc., Philadelphia, Pa.—Alloy known as dissteel for planer and similar knives; a further line of circular saws with new properties.

Norma Hoffman Bearings Corpn., Stamford, Conn.—Pillow blocks and mountings; felt protected greaseal ball bearings.

Lunkenheimer Co., Cincinnati, Ohio—Non-metallic disk bronze valve.

Pennsylvania Lubricating Co., Pittsburgh, Pa.—Lubricating compounds for the new continuous 4-high cold rolled mills.

Thos. Prosser and Son, New York—Spedia lapping welds and spedia hand laps.

Bakelite Corpn., Bound Brook, N. J.—Impact molded material; resinoid paper and board; cast resinoids.

Leeds and Northrup Co., Philadelphia, Pa.—Recording and indicating instruments.

American Chain Co., Bridgeport, Conn.—A line of brittle materials produced by submerged cutting machines.

Geometric Tool Co., New Haven, Conn.—Die head.

Norton Co., Worcester, Mass.—Alundum rubber bonded safety treads.

Philadelphia Gear Works, Philadelphia, Pa.—Speed reducers.

Whitney Mfg. Co., Hartford, Conn.—Steel conveyor chain for breweries; roller chain flexible coupling; vibration dampener for chain drives.

Parish Pressed Steel Co., Reading, Pa.—Alloy steel reels to compete with wood reels for shipping high tension transmission cables.

Independent Pneumatic Tool Co., Chicago, Ill.—Bakelite blades for rotary motors.

Eastern Corpn., New York—Demountable conveyors.

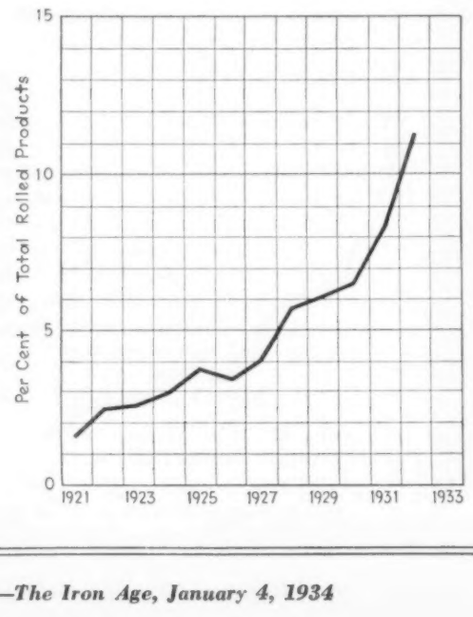
Jeffrey Mfg. Co., Columbus, Ohio—Vibrator conveyors for bulk material.

Steel and Tubes, Inc., Cleveland, Ohio—Boiler tubes, milk cooling systems.

General Electric Co.—Flat top household refrigerators; air conditioning systems; commercial condensing units; room coolers.

Ascendency of Strip Steel

THE steadily mounting consumption of strip steel is made clear, irrespective of the varying annual volumes of production, by noting what percentage of each year's total rolled iron and steel output is represented in steel strips. Here are the figures and at left is the percentage line:



YEAR	STEEL STRIPS, M-TONS	TOTAL ROLLED PRODUCTS, M-TONS	PER CENT OF TOTAL
1921.....	238	14,774	1.61
1922.....	641	26,452	2.42
1923.....	866	33,277	2.60
1924.....	827	28,086	2.94
1925.....	1249	33,387	3.74
1926.....	1222	35,496	3.44
1927.....	1318	32,879	4.01
1928.....	2162	37,663	5.74
1929.....	2503	41,069	6.09
1930.....	1942	29,513	6.58
1931.....	1621	19,176	8.45
1932.....	1185	10,451	11.34

The Public Works Program As Related to Private Enterprise

By F. L. PRENTISS
Cleveland Editor, The Iron Age

THE Public Works Program on which the Government embarked during the early summer of last year was expected by the administration in Washington to accomplish much in starting the wheels of industry and in restoring normal business conditions. Industrial leaders, while perhaps not showing quite as much optimism as was in evidence in the national Capital, believed that industry, particularly in the metal field, would be greatly benefited by the pouring of enormous sums of Federal funds into circulation in expenditures for public buildings, warships, harbor and river improvements, flood control and irrigation, highways and bridges and for other projects including state and municipal construction work.

This impetus to industries would immediately create a demand for steel products and other materials in various lines of machinery and other equipment. Labor would be put back to work and the buying power thus created would prove a stimulus for the demand for consumer goods that would start the wheels moving in idle factories, decrease unemployment and drive away the final traces of the depression.

With the allocation of a $3,300,000,000 fund for public work the Public Works Administration, which is supervising the program under the direction of its administrator, Harold L. Ickes, put its shoulder to the wheel and definite allotments of large sums for specific Federal and other public projects were made rapidly after the organization began to function. However, the speed with which these allocations have been converted into contracts and actual orders for materials so far has not been as rapid as had been expected, although in spite of the lagging in the program many industries have already benefited, some of them rather mildly, through the awards made in carrying out Federal and Federal aided projects.

That the Public Works Program has not got under way more rapidly is due to various reasons besides delays resulting from Governmental red tape. These delays appear to have been far more extended in non-Federal projects largely for municipalities for which the Government has made direct grants or loans or both. In many cases it has taken these beneficiaries of Federal funds a long time to comply with the terms of the Government in providing their share of the financing. In numerous instances it has been necessary for municipal governments to secure authority for a bond issue by a vote of the electorate, thus holding up projects a considerable period.

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OVER $3,000,000,000 has been allotted from the total Public Works allocation of $3,300,000,000. But it takes time to move mountains and time to get huge sums of money into motion.

For this reason, the effects of Governmental public works appropriations are just beginning to be felt. Before many days, in increasing tempo, these effects will permeate all of the strata of private enterprise. Producers of finished steel and other metals, makers of capital equipment for construction and production and the metal-working industry as a whole will experience a stimulus from these activities in 1934.

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Effects Now Beginning to Be Felt

New demand for steel and for some lines of mechanical equipment for public work took an upward swing in the last few weeks of the year. As the new year starts with nearly all the funds for the Public Works Program allocated, it seems safe to predict that buying for these projects will increase materially during the first few months of this year. With the program well set to go ahead and with many contracts awarded and others about ready to be placed, the beneficial effects of the P.W.A. program on producing industries in the metal field should be far-reaching in 1934. Purchases of materials required for the carrying out of many of these projects are expected to continue through the year, and, in fact, the carrying out of some of the larger projects in the West will extend over a considerably longer period.

The extent to which individual industries, including steel mills and other plants in the metal field, the construction industries and capital goods industries, will benefit by the Public Works Program has been subject to much conjecture, and there is an absence of definite information as to the tonnages of various products that

will be required. This is partly due to the spreading out of allocations over a period of several months and to the time required in preparing plans and specifications after funds are available for a job. Producers in various fields have made some effort to secure data which would enable them to make fairly accurate estimates of the quantities of various steel products that will be used in carrying out the construction program, but find that the far-reaching program has not progressed far enough to enable them to make more than rather indefinite estimates.

Nearly all of the $3,300,000,000 fund made available for public work through the Federal Emergency Administration of Public Works has been allocated. Figures lately given out by the P.W.A. showed that the total allotments at the time were $3,073,381,202, leaving only a little over $200,000,000 to be allocated. Of the total appropriations $660,146,475 is for non-Federal projects including $182,807,500 granted to railroads. The Federal projects, including Federal aided highways, number about 10,000 and the non-Federal projects about 1100. The money allocated for non-Federal projects is going largely to States, municipalities and other political subdivisions for a wide variety of public improvements. Allocations also include a $100,000,000 fund for low cost housing and slum elimination, this sum being set aside for use in making loans to limited dividend corporations.

The Federal projects include public buildings, war ships, river and harbor improvements, lighthouses, flood control, irrigation, soil erosion control, improvements to national parks and Indian reservations and highway construction.

Building Construction Prominent

Public building construction stands out prominently in a long list of activities because of the amount that will be expended, the extension of these activities across the continent and the variety of steel products that will be required. For public building construction by the Treasury Department $55,877,135 has been allocated for post offices and other government buildings. In addition a considerable percentage of the grants and loans for non-Federal projects is for building work, including waterworks, schools, hospitals, power houses, prisons and jails, court houses, lighting plants, filtration plants, incinerators, bridges and other projects requiring large tonnages of structural and reinforcing steel as well as steel in other forms used in building construction.

While in general building construction in normal times the value of structural steel in a building is approximately 15 per cent of the total expense, the cost of the steel bears a very variable relation to the total amount spent for any particular job. One authority in the structural steel field has given merely as a guess that $1,000,000,000 of the money spent on P.W.A. jobs would involve the use of structural steel and that about $150,000,000 would be spent for structural steel for these jobs, probably spread over a period of a year or more. Substantial tonnages of sheet steel will be required in the construction both of Federal and non-Federal buildings. Fabricators of full-finished sheets will also be benefited by the demand for their products for interior trim. Builders' hardware also will be an important item.

The public buildings also will require heating boilers, radiation, plumbing equipment, steel pipe for heating systems and for part of the plumbing system. Post offices do not take as much tonnage of sheets and pipe as an apartment building or hotel, because their plumbing systems are comparatively small. However, their heating systems require about the same amount of material and equipment.

Numerous municipalities have taken advantage of the offer of Federal grants and loans to build new waterworks systems, extend their water mains and enlarge their sewer systems. A recent compilation showed that $43,000,000 had been awarded to non-Federal waterworks projects and $45,000,000 for sewers.

A large amount of both steel and iron pipe and fittings will be required for this work, but these projects are not far enough along for manufacturers to make an estimate of the tonnage that will be needed. So far pipe makers have benefited little from these activities. A rough estimate by these manufacturers is that for jobs already approved by the P.W.A. and those for which applications for funds have been made but not acted upon will require 500,000 tons of cast iron pressure pipe.

Flood Control Work

The War Department has been allocated $47,175,000 for flood control work, largely in the Lower Mississippi River district, and $171,256,000 for river and harbor work, of which $74,753,000 is appropriated for general improvement throughout the United States and the remainder is for Upper Mississippi and other western projects. The general river and harbor improvements consist of 90 projects including intracoastal waterways, harbor projects on the Great Lakes and seacoast projects. This work will include construction of dams and locks, sea walls and piers and breakwaters. Great Lakes projects will include in addition to breakwaters, dredging, widening and straightening channels. These projects will require large tonnages of steel, principally in structural shapes, plates, piling and reinforcing bars.

Contracts for several of the Missis-

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Principal Allotments of Funds by the Public Works Administration Involving Steel and Equipment Purchases

Naval Construction	$238,000,000
Highways	400,000,000
Tennessee Valley Authority	50,000,000
Civilian Conservation Corps	301,037,315
COMMERCE DEPARTMENT	
Lighthouses	$5,378,734
INTERIOR DEPARTMENT	
Boulder Canyon	$38,000,000
Casper-Alcova irrigation project, Wyoming	12,200,000
Grand Coulee Dam, Columbia River, Washington	15,000,000
14 irrigation projects	15,415,000
TREASURY DEPARTMENT	
Public Buildings	$60,000,000
Coast Guard	24,833,535
WAR DEPARTMENT	
Flood Control, Lower Mississippi	$44,120,000
Rivers and Harbors, general	74,753,700
Upper Mississippi	33,500,000
Missouri River	17,753,108
Bonnerville Dam, Oregon	20,250,000
Fort Peck Dam, Montana	25,000,000
Seacoast Defenses	7,000,000
Quartermaster Corps, Army Housing	57,240,615
Air Corps, Airplanes	7,500,000
Motorization	10,000,000
NAVY DEPARTMENT	
Construction of shore stations	$22,810,552
Airplanes, Improvements to Aircraft Power Plants, etc.	7,500,000
OTHER FEDERAL ALLOTMENTS	
Civil Works Administration	$400,000,000
NON-FEDERAL PROJECTS	
*Waterworks projects	$43,000,000
*Sewage projects	45,000,000
New York, Tri-Borough Bridge	44,200,000
New York, Tunnel	37,500,000
Sanitary District of Chicago	34,000,000
Federal Emergency Housing Corpn., available for loans for low cost housing projects	100,000,000
Loans to Railroads	182,807,500

*Some additional allocations have been made since these figures were compiled.

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sippi River and Great Lakes improvement projects have been placed. These include the Calumet Illinois-Indiana breakwater work and the Port Washington, Wis., harbor development. These two projects require 9000 tons of sheet steel piling. Other Great Lakes harbor work will be confined largely to dredging.

As an example of the varied steel requirements in improving rivers, a lock in one of the upper Mississippi River projects recently placed required, in addition to the large tonnage of structural steel, 250 tons of bolts, 75 tons of alloy forging bars, 60 tons of stainless steel, a considerable quantity of reinforcing bars and also pipe for hand railing. Dredging along the Great Lakes will create a demand for dredge pipe, but perhaps an addition to the supply of dredges will not be required for this work.

The steel requirements for the Naval construction program are fairly well known, as this activity seems to have made more rapid progress than most other parts of the P.W.A. program.

The shipbuilding program undertaken by the Navy Department for which $238,000,000 was allotted calls for 38 vessels requiring approximately 90,000 tons of plates and structural shapes. The steel requirements include 58,850 tons of plates, 25,850 tons of shapes and several thousand tons of special treatment plates and armor plate. Forgings and castings required will also amount to a considerable tonnage.

The construction of 21 naval craft including two aircraft carriers, one heavy cruiser, two light cruisers, 14 destroyers and two submarines have been awarded to seven private shipyards. The remaining 17 vessels will be built in 8 navy yards located on both the Atlantic and Pacific Coasts.

Lighthouses and Coast Guard Cutters

Construction by the Treasury Department and Department of Commerce will include lighthouses and coast guard cutters and stations. Cutters will require sheets and pipe in addition to plates, and some of the cutters recently built have stainless steel galleys and floor plates. There will be ramp runways in connection with coast guard stations requiring steel piling and reinforcing bars.

Allotments to the Interior Department include approximately $150,000,000 for Boulder Dam work and several irrigation, soil erosion control and other projects. These include the Grand Coulee Columbia River dam project in Washington involving, when completed, a cost of approximately

$64,000,000, and for which $15,000,000 has been allocated; the Boulder Dam project for which $38,000,000 has been allocated, and the Caspar-Alcova irrigation project in Wyoming, for which $12,200,000 has been allocated. A rather extensive improvement program has been mapped out for some of the national parks and this calls for roads and trails, electrical and fire fighting equipment. Indian projects in nine states involve construction and irrigation work.

Army housing calls for an expenditure of $57,240,000 to be used by the Quartermasters' Department for improving army camps. The steel products required include pipe, sheets, conduit and in addition the kitchen equipment probably will take some stainless steel.

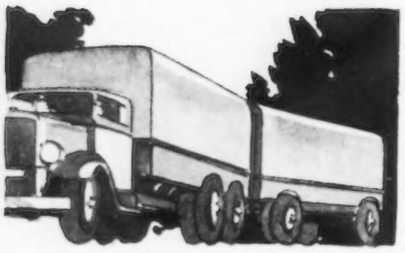
For highway construction in all States $400,000 has been allocated. This will be supplemented by the proportion of the expense to be borne by States, counties and municipalities. This work will require reinforcing bars and wire mesh for rods and culverts, but as uniform specifications are not followed, no estimate can be made of the amount of steel required for road work.

Twenty or more low cost housing and slum elimination projects have been developed to carry out extensive building programs with the aid of grants from $100,000,000 made available for that purpose by the P.W.A. Many of these projects are still in somewhat of an indefinite stage as to design and types of construction and the metal industries have no more than a vague idea of the amount of iron and steel products this building program will take. However, the carrying out of this program is expected to be of considerable help in reviving the building industry and will require a great deal of iron and steel in the form of sheets, pipe, heating equipment and hardware and in addition the requirements in plumbing equipment will stimulate non-ferrous materials.

Effect on Capital Goods Industries

Capital goods industries will be substantially helped by the Public Works program, although the extent of the benefit cannot be measured at present. The rehabilitation and modernization of mechanical equipment in army and navy plants will mean much to the machine tool industry. There has been appropriated about $2,500,000 for rehabilitation of the navy yards and already orders aggregating $1,000,000 have been placed for new machine tools for these yards.

Little new mechanical equipment has been provided in navy yards and army arsenals since the war, and it is stated that considerable of the machinery purchased during the war time rush for equipment was not of the best type. Machines 20 to 40 years old are still being used in plants of both departments. While army arsenals are said to be as badly in need of modern mechanical equipment as the navy, no machinery purchases for these arsenals have as yet been authorized. However, the machine tool industry has hopes that the P.W.A. will provide funds to permit the replacement of present obsolete equipment in



the arsenals. Private shipyards that will build some of the new naval vessels will also probably need additional equipment. Government orders for machinery will provide employment for engineers, draftsmen and skilled mechanics, who so far have been benefited but little from the Public Works Program.

Increased activities in privately owned metal-working plants, due to orders received in connection with the Public Works program, should also provide somewhat of a stimulus to the machine tool industry. Handling equipment manufacturers will experience some recovery in their business through orders for equipment to be used in the construction of dams, locks, irrigation and other Federal projects and also in municipal projects.

Some new demand has already developed for locomotive cranes with 2½ to 3-yd. buckets. However, contractors seem to be well supplied at present with cranes in smaller sizes. Manufacturers expect many of these will have to be replaced and that their orders will show a marked improvement by early summer. Several orders for medium sized steam shovels have been placed recently for public work and quite a few quotations have been made on other inquiries, some of which probably will result in orders later.

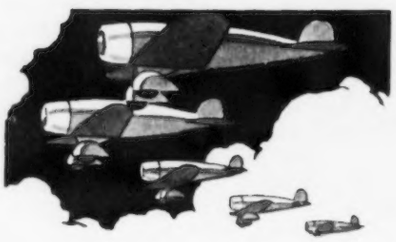
Construction of dams, locks and highways is expected to stimulate a demand for concrete mixing equipment.

A large tonnage of coupling bolts and nuts will be required for cast iron pipe for gas and water lines and other construction work will stimulate the bolt and nut business.

Motor Trucks and Aircraft

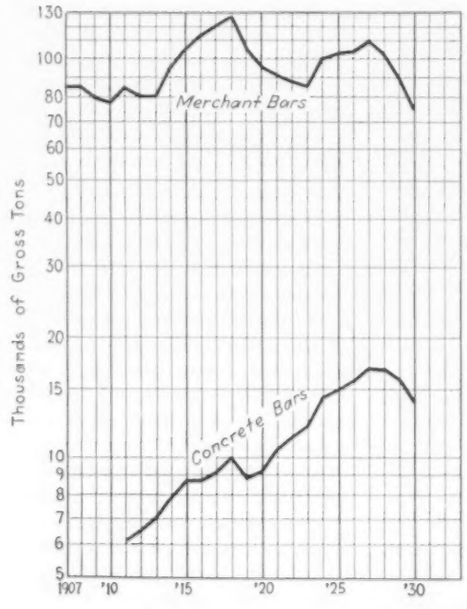
Motor truck and airplane manufacturers will share in the benefits of the Government program through the placing of large orders for their products. For army motorization $10,000,000 has been allocated which will be used in the purchase of nearly 8000 trucks. Considerable motor truck equipment will also be required by the Government in carrying out its construction program and by contractors having Government work. Recent large Government orders for motor trucks have already resulted in some good sized orders for truck bodies requiring plates. For airplanes for the Army Air Corps $7,500,000 has been allocated and the Navy Department has been allocated a similar amount which it will use for the purchase of 130 aircraft.

Demand for shovels, picks and wheelbarrows was greatly stimulated



near the end of the year by calls for these from the Civilian Conservation Corps, the Civil Works Administration and other Government agencies. This was immediately reflected in improvement in activities in plants making these tools.

The iron and steel industry and some of the industries in the capital goods field that have suffered very severely during the depression will be helped very materially by the demand for their products from the railroads that lately has been developed through Federal aid in the form of loans. These have revived railroad buying that has been at low ebb for the past two or three years or more. Not only will the car builders, and to some extent the locomotive shops, get busy with new orders but the steel industry is being called upon for hundreds of thousands of tons of steel for cars in addition to the orders already placed directly with the mills or in prospect for rails and track equipment. The car orders also will reflect in a demand on foundries for castings. Railroad electrification projects will stimulate the demand for electrical equipment.



Per Capita Production of Bars

THE picture of the production records of steel bars is one of a sidewise movement as regards merchant bars, when expressed as output per capita per annum, but one of a rapid rate of growth as regards concrete bars. The curves are five-year averages, centered.

By 1918 production of merchant bars, both iron and steel, was of the order of 5,840,000 gross tons, making the per capita output 128 lb. a year. Production for the years 1925 to 1929, inclusive, centered in 1927, was actually less—5,750,000 tons—and with a population increase meanwhile of over 14 per cent, the per capita per annum production was 110 lb., the second peak of the curve.

That the production of concrete bars is shown to be one of rapid rise is not surprising in view of the expansion of concrete-steel construction. From a per capita output of 6 lb. a year in 1911 the notably steady demand brought about a production rate for the years centered in 1927 and 1928 of over 16½ lb. The vogue for concrete bars is also indicated by the fact that, from the peak of 1927, the recession in them has been of the order of one-sixth while that for merchant bars has been nearly one-third.

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As the student copies the master,
So man, looking at the stars,
Has noted motion in its utmost grandeur.
Silent, frictionless, precise,
Revolving in a myriad million orbits,
Suns, planets, satellites—
Apotheosis of power transmission.

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Put your drive problems up to Link-Belt positive drive specialists — and forget troubles, such as:

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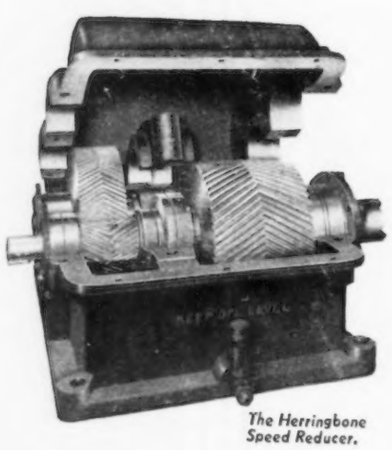
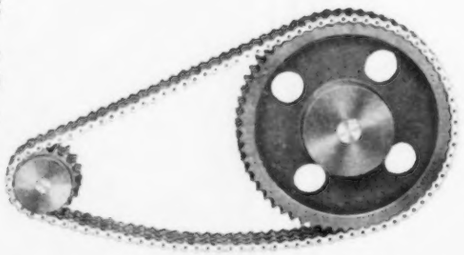
2. *The loss of production because the machine is not operating to capacity, due to the drive.*
3. *Breakdowns due to the drive—it might have been poorly selected for the service.*
4. *The production time lost while repairs are being made.*
5. *The dissatisfaction of piece-rate workers whose earnings stop if the drive should fail.*



The Herringbone Speed Reducer.

These are some of the many troubles you can forget if your drives are correctly engineered, selected for the individual service by experienced Link-Belt positive drive specialists. Their aim is to recommend the drive that will serve your individual needs best.

This unique Link-Belt service is made possible because of many years of experience with power transmission problems, and the fact that the entire range of positive drives listed in this advertisement is built complete by Link-Belt. Send for catalogs.



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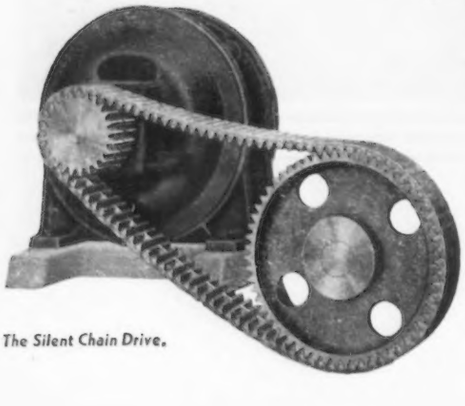
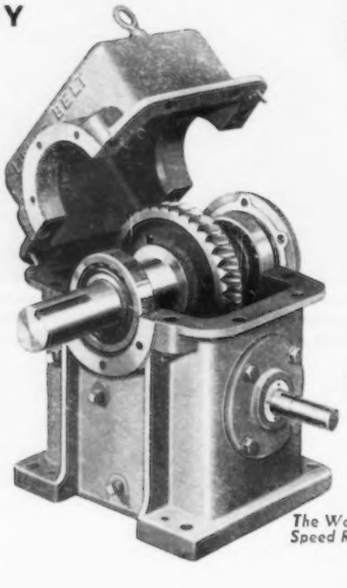
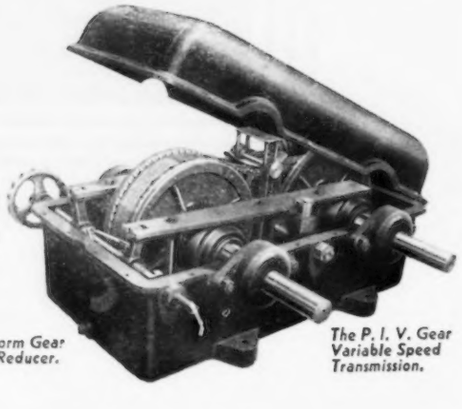


The Silent Chain Drive.



The Worm Gear Speed Reducer.



The P. I. V. Gear Variable Speed Transmission.

Mechanical Power Transmission During 1933

By WILLIAM STANIAR
Mechanical Power Transmission Engineer
E. I. Du Pont de Nemours & Co.

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THERE was no lack of development in the mechanical power transmission field during the past year. On the contrary, increasing intricacies of industrial operation stimulated improvement of transmission mechanisms in four distinct divisions of use. Mr. Staniar, in this review of the year's progress, describes these developments and also some notable improvement in the transmission accessory field.

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REGARDLESS of the industrial inactivity of the past four years there has been no cessation of effort on the part of certain manufacturers and individuals to improve mechanical power transmission methods and devices. Their efforts in this field during a period of dullness have been based on a realization that the return of prosperity would create more exacting demands for efficiency and economy in the transmission of power. This has resulted in a number of new devices and improvements on existing methods being introduced during the year 1933.

The intricacies of industry have developed to such an extent that the 1933 requirements of power transmission equipment may be segregated into four distinct features, namely—compact high and moderate ratio direct driving, high starting torques, short center flexible connection and infinite speed variation. This general demand has created a fertile field for invention and improvement based on certain limitations of the equipment available prior to this period. Invention and improvement in the four general features stated have also produced improvement in certain transmission accessories.

Compact High and Moderate Ratio Direct Driving

The problem of close coupled high and moderate ratio direct connection has been solved to a considerable extent for moderate powers by the motorized reduction gear unit, commonly known as the gear-head motor. Although the actual introduction of this device to the trade occurred prior to 1933, that year saw its real development by its respective manufacturers

Gustave Fast, consulting engineer and a leading authority in the transmission field for many years. Responsible for invention of high starting torque clutch during 1933.

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GUSTAVE FAST

GEORGE L. MOREHEAD

George L. Morehead, vice-president of Link-Belt Co., and in general executive charge of Philadelphia activities. Prominent in the development of transmission design and in the application of modern principles of merchandising.

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J. EDGAR RHOADS

J. Edgar Rhoads, of J. E. Rhoads & Sons. Prominent in improvement of pivoted motor-base drive.

Russel C. Ball, president, Philadelphia Gear Works since 1920, prominent in the year's progress in speed reducer development.

RUSSEL C. BALL

Fig. 1—The trend toward compact motorized reduction units is shown in this "straight through" helical reducer, in which the motor supports the unit.

Fig. 2—Reversing the thought expressed in Fig. 1, in this case, the reducer supports the motor.

and its greatest use as a power transmission medium.

The motorized reduction unit is available for straight through horizontal driving, straight through vertical driving, offset and right angle driving. The horizontal and vertical units can be obtained with either single or double planetary gear reductions or single or double helical gear reduction, while the right angle machine utilizes either the worm or spiral bevel gears. The general construction of such units varies with the respective manufacturers; in one type employing the planetary gear system the motor supports the reduction gear for low powers and ratios, while for higher powers and ratios the reduction gear supports the motor. In another design utilizing helical gearing in single or double pairs the motor supports the reduction gear as shown by Fig. 1, or the reduction gear supports the motor illustrated by Fig. 2. Another prominent type of horizontal motor reducer employing the planetary single and double reduction gear system, illustrated by Fig. 3, supports both motor and gear-head in one integral casing for all powers and ratios. A vertical motorized unit by the same manufacturer using the planetary system is shown by Fig. 4.

In machines of this character it is obvious that motor trouble will cause complete shut down of the unit. In view of this possibility and without sacrificing compactness, 1933 saw the introduction of the cradle type motor reducer illustrated by Fig. 5. The individual motor is supported in a cradle-like extension of the reduction gear base and closely flexible coupled to the unit. Thus if motor trouble arises a spare motor can be immediately installed.

Standard A.C. motor speeds of 900-1200 and 1800 r.p.m. can be employed with all types of motor reducers using either the squirrel cage, totally enclosed fan cooled, or the explosion proof types. The powers range from fractional to 75 hp. with possible ratios from 3:1 to 90:1. From 25 to 75 hp. capacity the ratio capacities are slightly less.

Another device for high ratio compact service known as the "Heliocentric" speed reduction unit, has been recently introduced. It employs a new and different principle of reducing velocity ratio and is available in separate or motorized designs. This device employs a battery of plungers operating reciprocally. These in turn are actuated by an eccentric on the input shaft and engage a stationary gear rack locked to the casing. The single stage units are designed for fractional and moderate powers and moderate ratios, while higher powers and ratios are accommodated by multiple stage units. In the multi-stage units ratios as high as 1,000,000 to 1 are possible.

High Starting Torques

Electrical installation economy has been brought about by the introduction of "Across the Line" starting for motors. This, however, in many instances imposes serious mechanical difficulties on various types of industrial manufacturing equipment owing to their high starting torque, a feature necessitating gradual and smooth load pick-up. In view of this several devices capable of being interposed between motor and load were placed on the market during 1933.

One of the latest and possibly the most unique is a coupling and clutch utilizing the shear stresses in the oil films between highly resilient conical friction rings. When employed for high starting torques and as a friction clutch the smooth starting of the

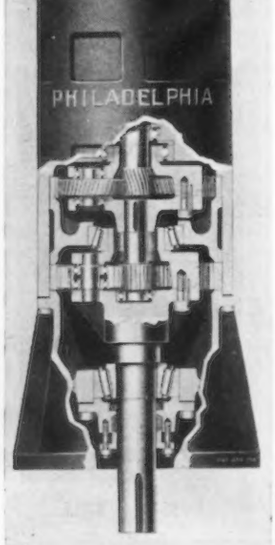
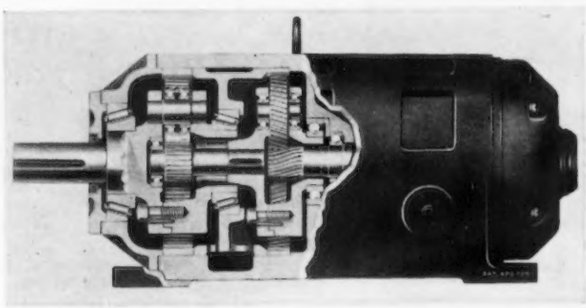


Fig. 4—A vertical adaptation of the planetary system shown in Fig. 3.

Fig. 3—Note the compactness of this planetary reducer with integral casing supporting both motor and gear systems.



load is assured by the slippage between the oil films attached to the metallic rings. These films being gradually reduced in thickness increase the shear stresses until slippage ceases and metal to metal contact is established.

The new and outstanding feature of this device is the co-adjustment or self-alignment of the rings, composing the friction elements, which automatically distributes the pressure uniformly over the entire friction surface. The advantage of this is increased power transmission capacity by virtue of a greater unit pressure being permissible than is ordinarily feasible. This device is available as a clutch for line-shaft operations and as a coupling for direct connection between motor and load for any speed or power requirement. The construction of the coupling is shown by Fig. 6.

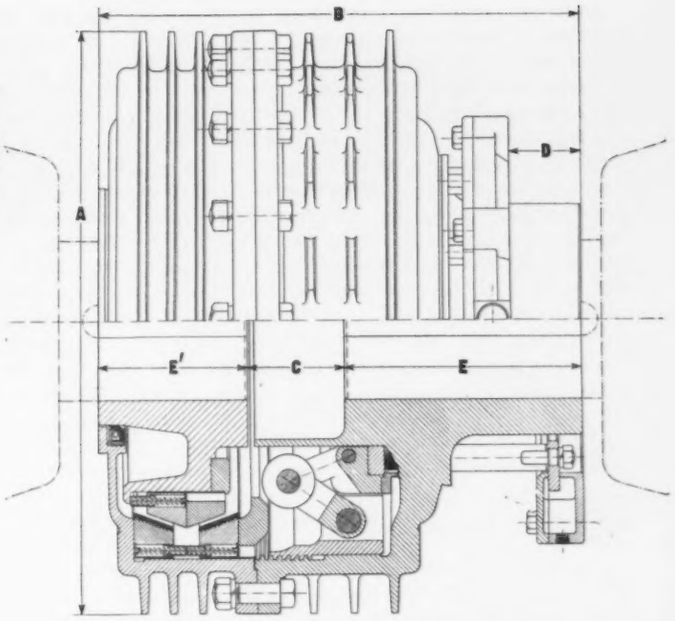


Fig. 6—A new and unique coupling for high starting torque. This device utilizes the shear stresses in oil films between resilient conical friction rings.

The "Slip Ring Starter," shown by Fig. 7, reached certain phases of development during 1933 based on an increased demand for high starting torque devices. This device is designed to handle such problems and is capable of transmitting uniform torque and horsepower regardless of variable friction conditions. In addition to this function it serves as a flexible coupling between motor and load. It is also designed to act in its starting torque capacity in connection with a pulley or sheave direct keyed to the motor shaft. This device comprises three separate parts; a hub section and integral rim, a flexible band of a length that almost completely wraps the inside diameter of the rim of the driven member and a driver member which consists of a hub section and driving lugs. The driving lug connects to the one end of the flexible band. When the driving member starts rotating it drags the weighted flexible band around the inside of the driven member and as the speed increases, the action of centrifugal force increases the drag of the band on the driven member, therefore gradually accelerates it until the speeds synchronize. This device is available for any practical speed and power requirement.

A high starting torque device introduced during this period is shown by Fig. 8. The manufacturer claims smooth gradual load starting and cushioning of overloads, reduction of electric current consumption, the possibility of using smaller motors operating closer to their maximum capacity and the elimination of shear-pin and flexible couplings. The action of this device depends on centrifugal force and its construction involves two drum shaped members, one attached to the driving shaft and the other to the driven shaft. Between driving and driven members are inserted two sets of floating segments made of brake lining reinforced with lead, the amount of lead being calculated to give the required centrifugal pressure for carrying the load. The outer segments are actuated by the driving member, the inner by the driven member. The two are claimed to give just the right combination of smooth starting and overload protection. This coupling is designed for standard motor speeds from 495 to 1750 r.p.m. and powers ranging from fractional to 400 hp. It can also be employed integrally with motor pulley or sheave.

Short Center Flexible Connection

Short center driving by belt, V-rope and chain is in constant demand based on space limitations and the flexible, shock absorbing characteristics of this method of transmitting power. The short center flat belt drive, however, had always been a source of trouble, due to the necessity of extreme belt tension. The introduction of the pivoted motor drive overcame this difficulty because it utilizes the motor as a means to synchronize belt tension to the actual load requirements by a pivoted action of

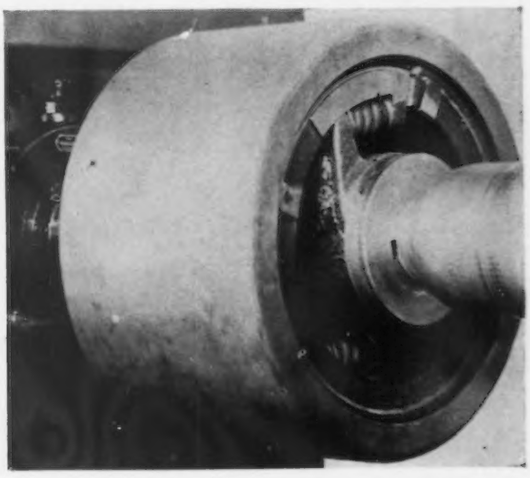


Fig. 7—The slip ring starter transmits uniform torque and horsepower regardless of varying conditions and also acts as a flexible coupling.

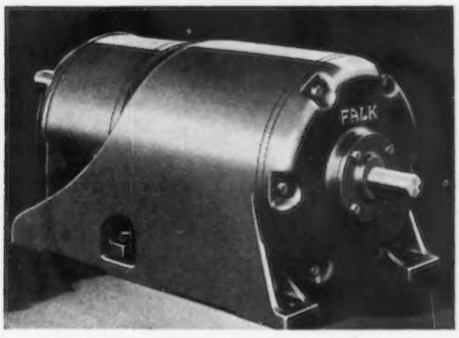


Fig. 5—A new cradle type motor reducer, which provides for quick motor replacement without sacrificing compactness.

the motor supports. In many instances in industrial driving it is necessary to place the motor directly vertical over the driven machine or it is necessary to hang the motor inverted from the ceiling and drive horizontally. Prior to 1933 the pivoted motor bases available would not permit vertical down driving and the ceiling installation was not entirely practicable. A new development in this device appearing during 1933 makes practicable both the vertical down drive and the ceiling installation. When the motor is directly above the driven shaft means must be provided to take the entire weight of the motor and in addition furnish the necessary initial belt tension. This is now accomplished by spring tension integral with the base as shown by Fig. 9. Ceiling drives are usually difficult of access, therefore it was necessary to provide increased automatic belt stretch take-up facilities on the pivoted motor base if this device was to be practicable for this service. An improved base of this character is now available. It not only provides additional take-up facilities but also eliminates the hazard of motor falling. The pivoted motor installation for all classes of short center flat belt driving is available for powers ranging from fractional to 400 hp. and for motors of all standard speeds and voltages.

A unique short center flat belt device which synchronizes belt tension with load requirements and in addition acts as a speed reduction unit is shown by Fig. 10. This device is capable of ratios up to 40:1 and is designed for powers from fractional to 50 hp. It is now employed extensively in Europe and Australia and will no doubt be introduced into this country during 1934. This device is composed of a gear, pinion, pulley, spindle and fulcrum arm or casing. The pulley and pinion are keyed to the spindle which is supported by the fulcrum arm or casing centered on the shaft to be driven. The gear is keyed on the driven shaft and meshes with the pinion on the spindle. Thus, in the rotation of the spindle by the aid of a belt from motor to spindle pulley, the pinion tends to make an epicyclic movement around the gear wheel with which it meshes, but such movement is restrained when the belt has been tensioned and the continued rotation of the pinion will rotate the gear wheel and thus operate the apparatus or line-shaft. The high ratio possible is accomplished by a multiple of the belt and gear ratio. A maximum of 5:1 is practicable for the belt with this device and a gear ratio 8:1 is feasible.

Infinite Speed Variation

Based on the continued demand for compact mechanical infinite speed variation 1933 saw the introduction of a unique method for this service in the form of an infinitely variable speed motor pulley. This device as shown by Fig. 11 represents a simplified, extremely compact and efficient variable speed unit, applicable directly to the regular shaft of any standard constant speed motor. Infinite speed selectivity is possible over a range of 3:1 ratio for motors of fractional to 7½ hp. This pulley functions as the actual driving element between the motor and the driven shaft and it requires practically no more space for its installation than any standard belt or chain drive. The variable speed motor pulley consists of an assembly of two opposing cone-faced discs, one stationary, laterally, the other sliding and an adjustable compression spring, all of which is self contained and mounted on the motor shaft. In addition a special motor base for the purpose of motor movement forward and backward is required. The connection between driver and driven is by means of a special V-belt which contacts on its sides between the cone-faced discs and on its inner flat surface over the driven pulley. The operating principle is primarily based upon this utilization of both the V-sides and the inner flat surface of the belt and the adjustable driving diameters formed by the cone-faced discs. The total movement of the motor on the special base is approximately 2 in. on the smallest size unit and six in. on the largest size. In addition to manual control, electrical remote control by push button is available in connection with this device.

The utilization of the hydraulic principle for infinite speed variation was introduced during this period in the form of the hydraulic coupling.

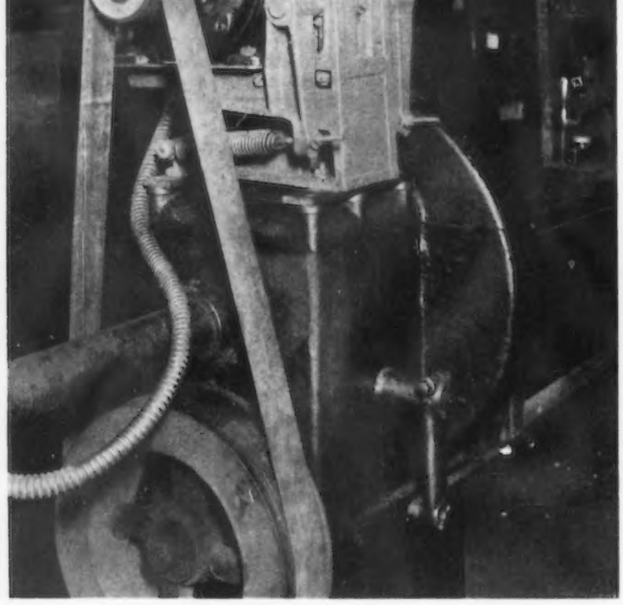
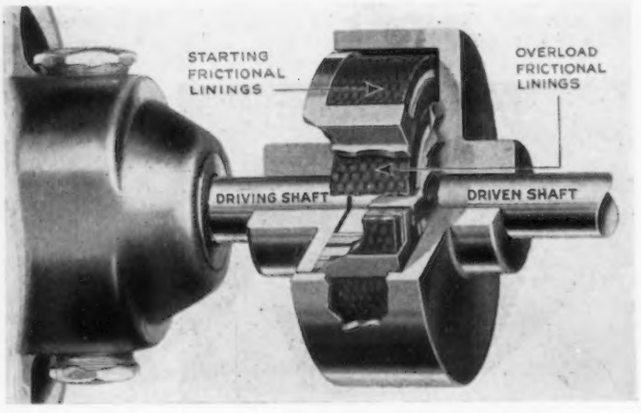


Fig. 9—Down-driving from a pivoted motor base was made possible, during the past year, by the development of this spring tensioned base.

Fig. 8—This high starting torque device, introduced in 1933, provides smooth gradual starting and cushions overloads.



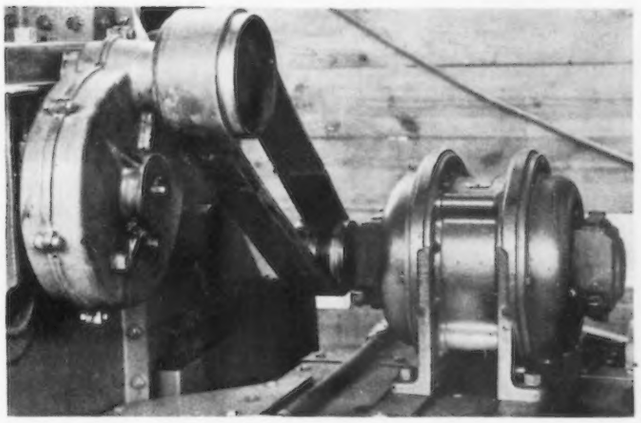


Fig. 10—In this unique European device, a reducer is combined with a flat belt tensioning mechanism. Tension is produced by the epicyclic tendency of the pinion.

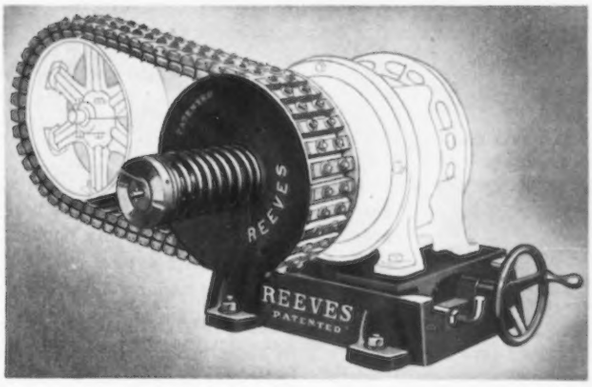


Fig. 11—Infinite speed selectivity is a feature of this new variable speed motor pulley.

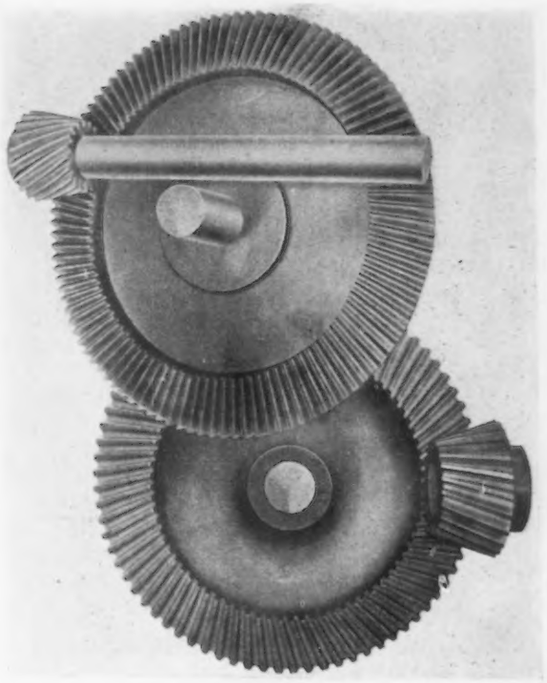


Fig. 12—Development of the "hypoid" gear, or curved tooth spiral bevel, was a feature of 1933's progress.

The characteristic feature of this device is the scoop tube and circulation system by which infinitely variable speed regulation can be obtained. The variable speed hydraulic coupling is an excellent disconnecting unloading clutch, shock absorber and flexible coupling. It affords the use of simple, economical constant speed across-the-line induction or synchronous motors to drive fans or other apparatus at variable speeds. It is claimed that the hydraulic coupling not only promotes economy from the motor kw. input standpoint, but makes possible economical power factor correction. The coupling also serves as an excellent unloading clutch to allow the synchronous motor to "pull in" easily. This coupling operates hydraulically, therefore there is no mechanical connection between the driver and the driven halves. Power is transmitted by the kinetic energy of the liquid discharged by the impeller directly against the vanes of the runner. This type of coupling based on its principles of operation can be employed to a great advantage for the driving of fans and centrifugal pumps of any size or power requirement.

An improvement in rubber belting known as "Compensated" construction was introduced during this period. An improvement that to a great extent eliminates ply separation and increases the frictional contact between belt and pulley. Heretofore it has been the practice to make all duck and rubber belting flat. This procedure would be entirely correct if a belt were used to only pull a straight draw-bar load. However, when a belt is bent over a pulley, the outside ply of the belt is subjected to a greater stress due to increased circumference of the ply while passing around the pulley. Rupturing of the outside ply is a common fault of standard friction surface rubber belting. This improved construction overcomes this to a considerable extent because only a portion of the maximum ply stress on the belt comes between the pulleys, based on all plies being compensated or counter-balanced, which allows the outside plies to be more extensible. The maximum ply stress on every belt is at the small pulley. Hence by a reduction of ply stresses while flexing, the useful life of the belt is prolonged. This type of rubber belting is also constructed with a special pulley contact surface possessing a high co-efficient of friction which enables the greater part of the total tension on the belt to do effective transmitting of power. When the frictional coefficient of a belt is low, the total tension must be raised to increase its pulley gripping power. Excessive tension causes wear on bearings and other transmission equipment.

Multiple V-Rope Driving

Since the advent of the V-rope drive rapid progress has been made in the development of the ropes and sheaves. Until the beginning of 1933 all makes of ropes were made endless, thus confining their use to direct motor driving, based on the necessity of take-up facilities and limitation of center distance capacity. This method of driving is now applicable to all manner of flexible driving regardless of center distance and take-up facilities based on the recent introduction of an efficient and practical fastener or coupler for the individual V-rope. This device is designed to fit the V-grooves of the sheave, possesses flexing qualities and its grip on the ropes is dependable.

To meet the exacting requirements of machinery manufacturers a new and totally enclosed friction clutch

(*Continued on Page* 168)

Automotive Curve Industry Prepares

By BURNHAM FINNEY
Detroit Editor, The Iron Age

Walter P. Chrysler and Fred Zeder, vice-president in charge of engineering of Chrysler Motors, are shown above with two of the models used in wind tunnel tests preceding introduction of the Airflow De Soto.

NINETEEN THIRTY-THREE will be recorded as a memorable year in the annals of the automobile industry. Even though the depression's worst blow was struck in March with the closing of the nation's banks, motor car manufacturers were able to exceed their fondest hopes by producing and selling approximately two million cars and trucks.

The buoyancy with which the automobile industry rebounded from blow after blow during the depression led to the coining of the saying, "Hope springs eternal in Detroit." The attainment of maturity has not robbed the industry of its youthful enthusiasm or its inexhaustible vigor. It is proud of the fact that following the banking debacle the country saw the first rays of industrial recovery on Detroit's horizon and that the force which raised steel operations almost overnight from 13 to 57 per cent derived its chief strength from a re-energized automobile industry.

When one looks back over the past 12 months, one sees certain high spots —the dreary Briggs strike of late January and February, the Michigan bank holiday lasting a full six weeks, the production rush starting in April and defying seasonal influences as it continued through the entire summer, the spectacular rise of Chrysler at the expense of both Ford and General Motors, the industry's victory in securing a code containing the now-famous "merit clause," the tool and die strike and the feverish preparations for what automobile executives are unanimous in believing to be a year of marked recovery ahead.

Three Leaders Get Firmer Grip

The three companies which dominate the industry—General Motors, Chrysler and Ford—got a firmer grip during 1933. They increased their percentage of the total units sold to 90 compared with 82 in 1932. Chrysler, making impressive gains with its Plymouth and Dodge cars, dislodged Ford from second place. During 1932 one out of every six cars sold in the United States was a Chrysler product. The proportion grew the past year to one out of every four.

General Motors, still in first position by a comfortable margin, sold 44 per cent of the industry's total, as against 42 per cent the previous year, making impressive gains with both Chevrolet and Pontiac. Ford slipped back several points so that only one out of every five cars registered was a Ford.

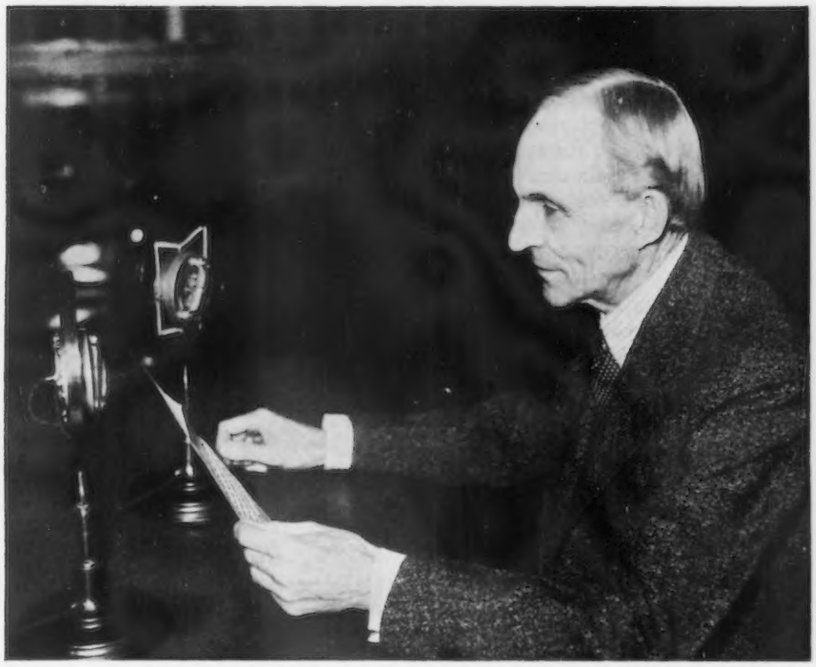
An analysis of registration figures shows that the motorist in 1933 was keeping an eye closely on his pocketbook when he bought a new car, for automobiles selling under $750 greatly expanded their volume at the expense of all others. In the first 10 months of the year Chevrolet, Ford and Plymouth made retail deliveries of 929,373 units, or 46 per cent more than in the corresponding months of the previous year.

Other makers of cars priced under $750 sold almost three times as many units as in 1932, Pontiac and Dodge being the outstanding companies. In a year of growing volume for the industry there were 54 per cent less cars sold in the $1,500-$2,000 range, 40 per cent less in the $750-$1,000 group and 25 per cent less in the $1,000-$1,500 class. The loss in the quality group, ranging from $2,000 up, was less devastating than in the so-called medium price class.

Little New Mechanically in 1933 Cars

Mechanically, passenger cars in 1933 had little new to offer the public. Free wheeling, such a sensation in 1932, is rapidly lapsing into disuse and is no longer a talking point for salesmen. The trend during the year was toward further automatic features of a nature which would require no attention on the part of the driver. That is, for a time the number of gadgets on the instrument board in front of the driver increased alarmingly, but the trend is toward fewer knobs and levers to manipulate with the same functions being performed automat-

Rises and for 1934



Henry Ford presented his 1934 V-eight car to the public in the most modern manner. Here he is addressing his dealers in an international telephone hookup from his Dearborn laboratories on Dec. 7.

ically without any effort on the driver's part.

In the matter of styling the movement toward streamlining was given notable impetus. It will be recalled that the first change from conventional design toward sweeping fenders, rakishly slanting radiators and windshields and rounded curves at the rear of the car was introduced by Reo in 1931 and commanded slight interest. A year later Graham made a sensation with its cars, which carried Reo's ideas a step further. The entire industry took up with streamlining in a conservative way the past year, giving Graham the opportunity of advertising its car as the "most imitated in America."

As the year wore on, outspoken automotive engineers, such as William B. Stout, caustically criticized the industry for retaining designs which could not be justified scientifically and urged that manufacturers make a leap toward the truly streamlined car instead of progressing there by steps. Walter P. Chrysler accepted the challenge and today is giving the motorist an opportunity to purchase the first truly streamlined car—his Airflow De Soto. The eyes of the entire industry are upon this car's fortunes. If its success is in keeping with Mr. Chrysler's hopes, the streamlining of all cars will be hastened. Even though it may not go over as well as anticipated, it will not prevent the industry from continuing to move by gradual stages toward the essential windstreamed design which the new De Soto embodies.

C. F. Kettering, vice-president General Motors Corpn., predicts that before many years have gone by industrial workers will live 30 to 40 miles from their places of employment and will go back and forth to work over express highways at a speed of 100 mi. per hr. Harry J. Klingler, president and general manager Pontiac Motor Co., recently went on record to the effect that within 10 years all cars would be fully streamlined and speeds would be greatly accelerated. In automotive circles these statements are not considered wild guesses, but accurate prophecies of what is to come, probably in considerably less than 10 years.

The trend toward streamlining will strengthen rather than weaken steel's position as the leading material in the manufacture of motor cars. An outstanding automotive engineer is authority for the statement that streamlining, such as that attained by the De Soto, is possible only with an all-steel body. In view of the sweeping curves which are essential to streamlining, a composite wood-and-steel body would be expensive and difficult to fabricate.

This same engineer is convinced that, regardless of styling, it will not be many years until all cars, except perhaps the highest-price cars where low volume makes die costs prohibitive, will be of all-steel construction because of the safety factor alone. It is believed that manufacturers now building composite bodies will go over to steel 100 per cent as soon as investments in lumber tracts and in wood-working machinery are paid out. Incidentally the difference in weight in the amount of steel in an all-steel body and that in a composite body is not so great as one might think.

Demand for Alloy Steels Growing

What all automobile companies are aiming at is to achieve lightness of weight in a car without sacrificing strength and resistance to wear. Particularly in the higher medium-price brackets and in the quality group is there a concerted effort to eliminate dead weight which increases operating costs and adds little if anything to riding comfort. This is where alloy steels are finding a growing market. In the last year their uses in motor cars have expanded. They are destined to play a still more prominent role as the industry further approaches the day spoken of by Frank Spring, chief designer Hudson Motor Car Co., when the difference between an automobile and an airplane will be indistinguishable—either can be driven along the road or flown through the sky.

When one is on the subject of materials, one should not overlook the influence of non-ferrous metals. Aluminum cylinder heads and aluminum bodies for trucks gained ground during 1933 and seem headed for further expansion the coming year. Aluminum's chief characteristics in winning favor in the automotive trade are

high thermal conductivity and lightness of weight.

Magnesium alloys have proved themselves in extensive tests by automobile makers and their employment is likely to grow in the near future. Zinc and copper have held their own in competition with other materials. Nickel plating is maintaining its place both as a base for chromium plating and for other uses.

Because of its high price, rustless steel has not made much progress among automobile manufacturers. Ford continues to be by far the largest consumer, making front and rear lamps, hub caps and some smaller parts from it. Other companies are specifying it meagerly. All agree that they would like to use it more extensively and will do so if and when its price declines sufficiently.

Electric Furnace Metal Making Rapid Strides

The electric furnace process of making steel and alloy cast iron made tremendous strides the past year. Late in the year Ford began equipping some of its V-eight cars with cast alloy steel crankshafts, the metal being refined in the electric furnace. The V-eight Ford for 1934 has this cast crankshaft as standard equipment. Early in the year the Terraplane changed over from a forged steel to an electric furnace iron camshaft made by a patented process by the Campbell, Wyant & Cannon Co., Muskegon, Mich. This camshaft will be used in the Hudson car as well as the Terraplane in 1934. At least some of the Chrysler-made cars the coming year will have cast camshafts. Chrysler has developed an electric furnace molybdenum steel for the coil springs on its new cars.

Ways and means of protecting and improving exterior finishes have been devised. Today there is scarcely a manufacturer who does not rust-proof fenders, bodies and hoods before painting them. Cadillac has introduced the ducoing of fenders and hoods in addition to the body so that all exposed sheet-metal parts will remain lustrous over an exceptionally long period. Buick is doing the same thing on its 1934 cars. Ford has perfected a new enamel, the base of which is taken from the soy bean, which is used as a finish on every V-eight.

One practice introduced by a leading manufacturer against the united opposition of the steel industry was the specification of hot-rolled sheets instead of cold-rolled sheets for body stock. Steel mills realized that if this company's plans were successful their investment in cold-rolling equipment would be seriously impaired. This equipment had been largely developed as a result of demands from automobile makers for flat-rolled steel with superior finish. Fortunately for the steel trade this attempt to economize did not get far.

Upon the shoulders of W. S. Knudsen, as executive vice-president of General Motors Corpn., has fallen the burden of managing the corporation's car divisions.

Welding Gains in Favor

Welding was utilized more than ever before by automobile companies the past year. It is scheduled for further gains in 1934. As deeper-formed curves become prevalent on motor cars, steel mills will be called on to furnish steel with even greater drawing qualities than those possessed today. Stampings are continuing to make headway as against heavy castings.

Steel wheels of the artillery type and wire wheels have made gains at the expense of wood wheels. The manufacturing cost of these wheels has decreased considerably through the application of welding, and it now seems doubtful that wood wheels ever will recover their former popularity.

Equipment expenditures during 1933 remained at a depression level, although material improvement was perceptible in the late months of the year. Chrysler spent hundreds of thousands of dollars in enlarging the machinery capacity of its Plymouth plant, in equipping a new spring making department at its Dodge plant, in providing new tools for its Newcastle division and in expanding operations in certain parts departments at the Dodge factory.

Chevrolet spent well over $1,000,000 at its Detroit and Flint plants, particularly the former, in preparing for the manufacture of coil springs and of the entire new front-end unit. Buick is reported to have bought machine tools valued at $1,250,000 for a small car to be introduced in the spring of 1934. Early in the year Ford installed considerable new equipment at the Rouge plant for production of a revised V-eight which was put on the market in April. Some machinery likewise was purchased for the proposed small eight, plans for which have been held in abeyance for months.

Independent Parts Makers Lose Ground

Independent parts manufacturers derived slight comfort from the year's happenings. General Motors, in an effort to utilize idle space in its plants and to economize, pulled most of its casting work into its own foundries and became increasingly self-contained so far as other parts are concerned. It likewise consolidated its car manufacturing divisions in southern Michigan, thereby avoiding high transportation charges and cutting down overhead expenses. This resulted in the virtual abandonment of its Muncie Products division, Muncie, Ind., and of its Brown-Lipe-Chapin division, Syracuse, N. Y.

General Motors' trend toward self-integration was no more pronounced than that of Chrysler. At the beginning of the year it opened a body plant at its Dodge works to supplement its body building facilities at its Kercheval plant. However, it still is far from being self-sufficient in this respect. It has greatly expanded its capacity for making parts, such as transmissions, for all of its cars at the Dodge plant. Its foundry has been modernized and today makes the bulk of the heavy castings for all Chrysler divisions, outside foundries getting only the overflow instead of the main tonnage as they formerly did. As already mentioned, Chrysler has established its own department for producing coil springs.

Ford is the only important company in the activities of which outside suppliers perhaps have gained more than they have lost. It is true that the opening of its Ypsilanti, Mich., plant was no help to manufacturers of starters and generators and that the V-eight crankshaft now is cast at the Rouge plant instead of being bought outside in the form of a rough forging. On the other hand, for the first time in years, some of Ford's cylinder blocks have originated outside its own foundry and some lesser parts for-

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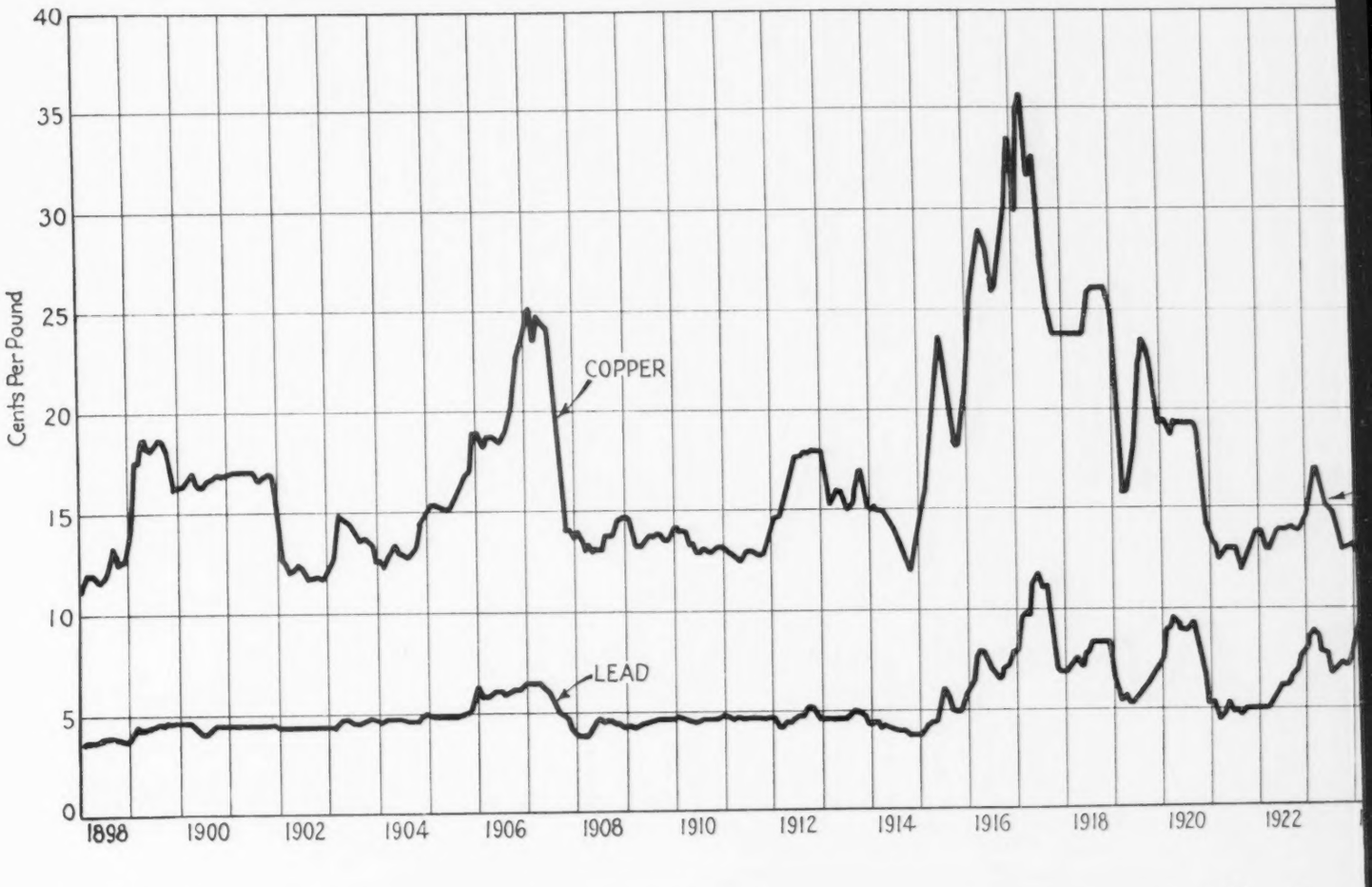
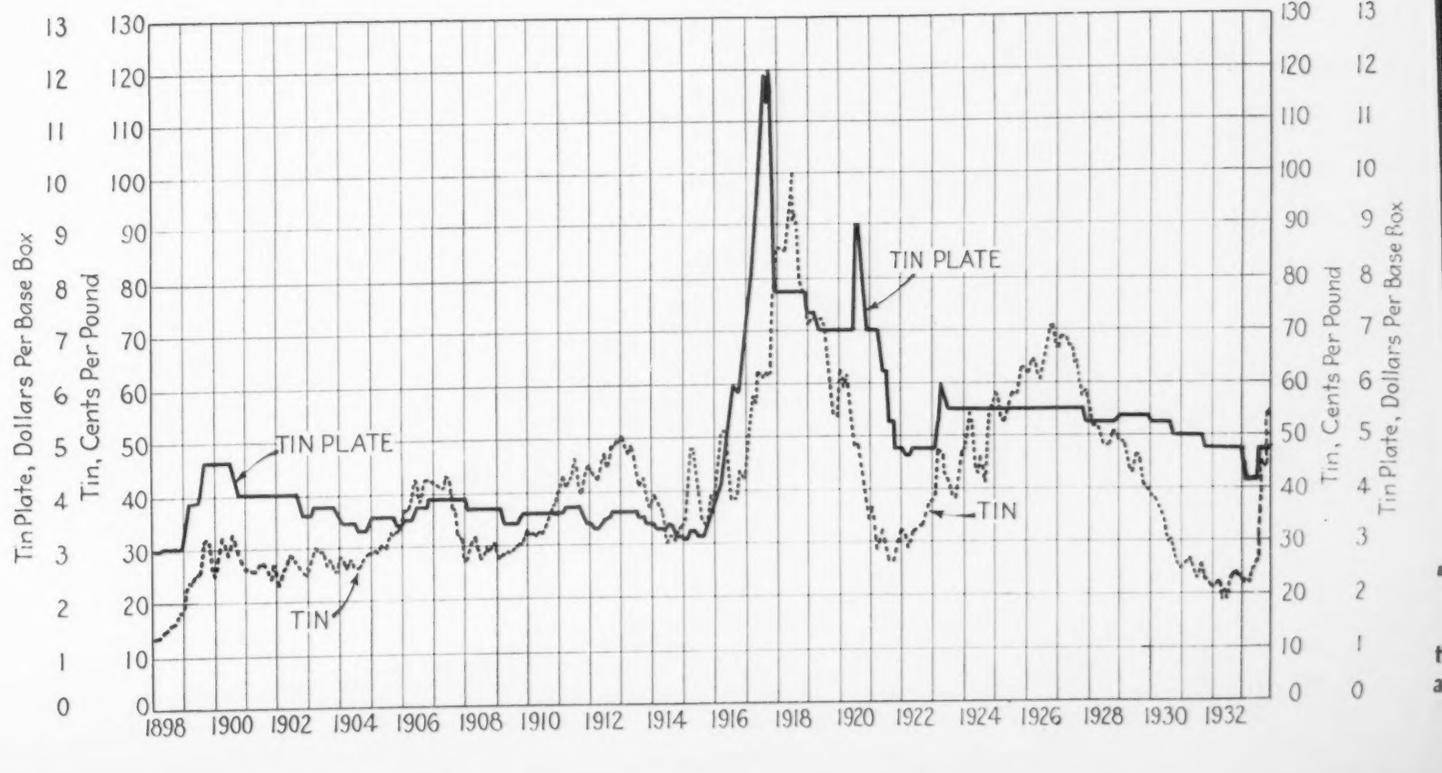
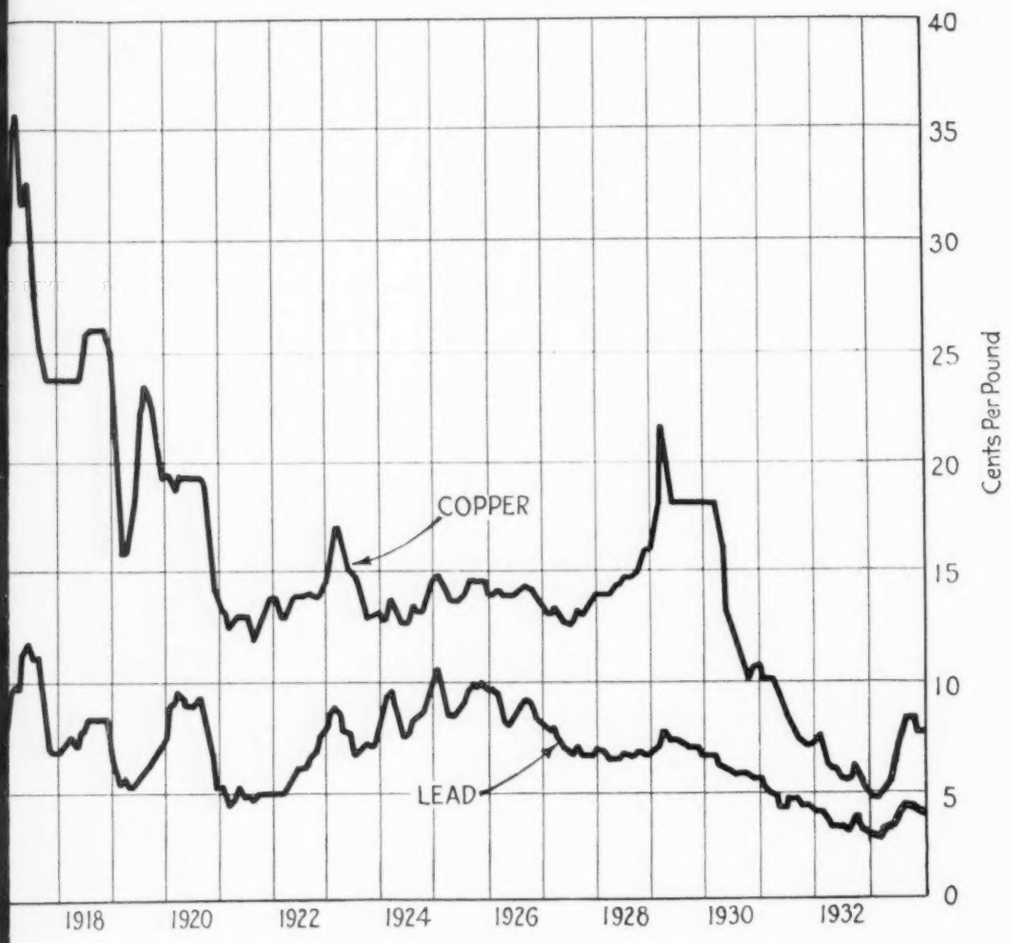
Long Term Trends of Monthly Copper and Lead Pri

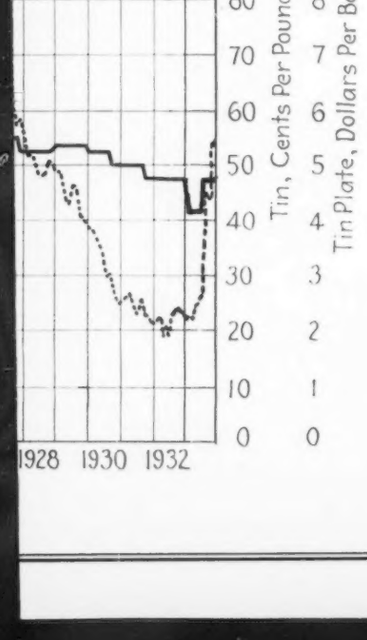




Copper and Lead Prices.



MONTHLY Prices of Copper and Lead at New York Refinery (Lake copper to 1920 and electrolytic copper since).



THE Spread of Prices Between Tin (at New York) and Tin Plate (at Pittsburgh) Has Again Been Narrowed.

(*Continued from Page* 94)

merly made at Dearborn now are purchased from vendors. Through the first 10 months of the year the Ford steel plant was shut down and steel was ordered from outside steel mills.

The plight of many parts manufacturers has grown progressively worse. They reached their zenith in the days when automobile companies mainly assembled cars and did not bother to make the parts. Today not a company remains which merely assembles cars, and the best opinion is that no such company ever again will be successful. The high cost of production on such a basis is said to be against it.

Notable Progress Made in Industrial Relations

In the field of industrial relations the greatest progress in years was made in the latter half of 1933. Each General Motors' manufacturing division organized an Employees' Association and Works Council to cooperate with the management in hours of labor, wage rates, working conditions, safety and accident prevention, promotion of health, welfare of employees, efficiency and economy of operation, and "other matters affecting employees' interests." The associations and works councils consisted solely of wage earners, and company officials met with the latter only on invitation.

Chrysler submitted to its employees a plan, which they approved by an overwhelming majority, for a Joint Council in each plant to handle matters such as rates of pay, shop rules, working conditions, safety, hours of labor, plant sanitation, employees' transportation and recreation. Consisting of an equal number of management and employee representatives, the Joint Council's avowed purpose is "to provide a means of friendly and lasting cooperation between employees and management on the basis of mutual confidence and understanding."

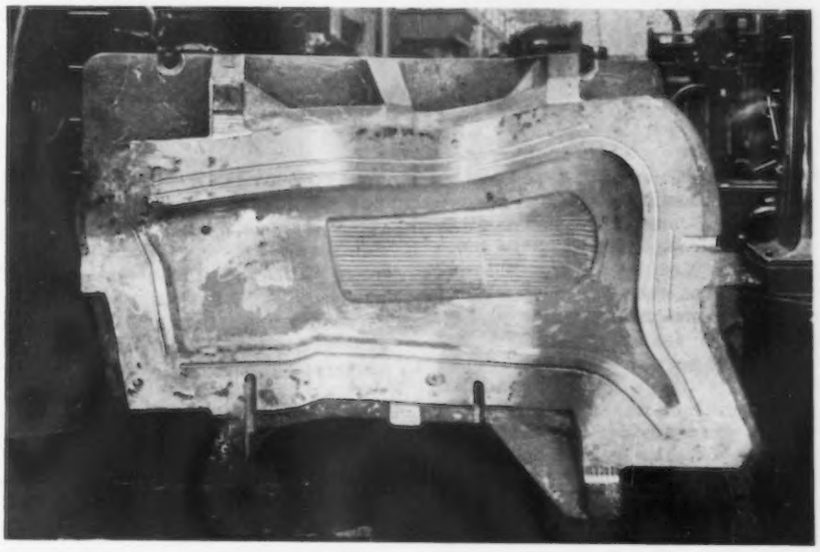
Establishment of this machinery whereby labor has a voice in many matters in which it is vitally interested has already brought concrete benefits to labor. Many sources of trouble, such as disparity between rates of pay in various groups growing out of new processes displacing old methods, have been eliminated. Shop conditions have been improved and many complaints of employees have been promptly and satisfactorily adjusted. In addition, higher executives have brushed shoulders with their workers as they never had before, while the workers in turn have found that the men higher up are human after all.

Although employee representation has been operating only a few months, its success is attested to by the setbacks which the American Federation of Labor is understood to be suffering in its intensive campaign to unionize the automobile industry. The union drive flourished in the weeks following passage of the National Industrial Recovery Act, but it is believed that its progress was halted several months ago. It is reported to have been losing ground in the last month. If a strike occurs at Detroit, it is likely to be a final desperate effort of union organizers to ward off failure.

Industry Trying to Stabilize Employment

The entire industry is grappling with the problem of trying to stabilize employment in the manufacture of a product the demand for which has notoriously fluctuated violently both annually and seasonally. A program, the details of which are not yet public property, probably will be started shortly in an endeavor to flatten out the employment curve. General Motors announced only a few weeks ago that it intends to spread highly seasonal work over as much of the year as possible. Where this is not feasible, men will be transferred to other classes of work in off-months and thereby given a more adequate income. The General Motors' proposal is to make all of its plants as self-contained as possible and stabilize employment city-wise by impartially distributing employment to the largest possible number of permanent residents.

Probably the greatest single change in management policy which occurred during 1933 was in General Motors. Paradoxically it concentrated authority yet promoted decentralization. William S. Knudsen's appointment as executive vice-president of the corporation spelled the end of the Buick-Olds-Pontiac combination, a depression venture, and the return of sales and executive autonomy to the individual divisions. On the other hand, it meant the substitution of rigid, "on the ground" control of all manufacturing operations at Detroit for the remote executive control previously exercised from New York. Upon Mr. Knudsen's shoulders has fallen the burden of management of the corporation's car divisions, including Fisher Body Corpn. He always has been a staunch advocate of decentralization during his long and notably successful reign over Chevrolet's fortunes.



Ford is using chrome nickel steel dies to form front fenders of the V-eight car. The radiator shell is formed in a die made of the same material.

General Motors Promotes Consumer Research

In the merchandise of its products the industry witnessed a growing divergence in the methods of two of its three giants. General Motors definitely committed itself to a program of consulting the consumer's wishes regarding what features it should build into its cars. It conducted a gigantic survey, sending out more than a million questionnaires to car owners to find out their preferences in such matters as speed, dependability, radiator design, ventilation, streamlining and automatic clutch. The results have been incorporated in the corporation's 1934 cars. In other words, General Motors is saying to its prospective

(*Continued on Page* 178)

GENERAL HUGH S. JOHNSON

▲ ▲ ▲ The Washington

THE New Year hails a new American economic system!

Swept aside, "rugged individualism" has made way for the ideology of the New Deal. Strange to the United States, there has been set-up a political, social and economic philosophy that if suggested a decade ago would have been rated as rank heresy by the great bulk of the population. So sweeping in scope is the transformation that it almost takes one's breath and challenges the imagination. Industry, finance, agriculture, labor, transportation, were all projected into the legislative arena and, with dazzling speed, shuffled into a Governmental "regimentation" at a special session of Congress under the forceful driving hand of Franklin Delano Roosevelt. Ill-considered, if considered at all, some of the legislation was of an emergency character. Part of it also was frankly called experimental, and given a two-year termination period. With the possible exception of the war-period under President Wilson, never was such a vast and tremendously important legislative program enacted.

Elected President by an unprecedented vote after three years of economic collapse in which unemployment mounted to the staggering total of 13,000,000. Mr. Roosevelt had an almost solid public back of him. With an overwhelming Democratic majority in Congress, he encountered no real opposition to the measures he jammed through the legislative mill.

There was neither public nor Congressional understanding of the far-reaching character of the legislation. It is safe to add that no mind or group of minds can to this day comprehend its full significance and implications. The pressure used by the President was not needed to force the hand of recalcitrants. They were so few in number that they were easily bowled over. In barely three and one-half months the New Deal program was driven through Congress. Discussion ever since has raged over the constitutionality of some of its provisions.

Monumental Legislative Program

Looking back, the accomplishments are indicated by the following legislative enactments: Banking emergency; legalization of beer; agricultural adjustment; forest camps; direct unemployment relief; securities regulation; farm mortgage relief; Tennessee Valley Authority; loans to home owners; railroad reorganization; industrial recovery; control of the oil industry; gold clause invalidation.

There was also Government economy legislation. But Government economy hardly can be reconciled with a $23,000,000,000 internal debt. Yet there was no outcry on this score. The prior theme song of "balance the budget" quickly gave way to the demand for relief for the unemployed, for agriculture, for industry, for finance. The nation was in no mood to be a stickler for platform pledges and with equanimity President Roosevelt was entrusted with such power as never before was given a peace-

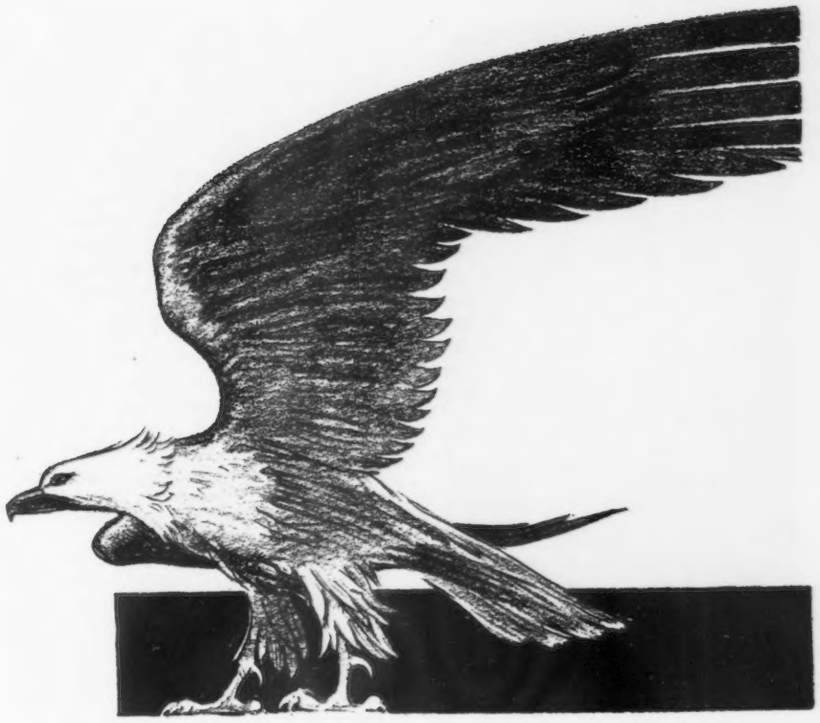
The Battle of the Metal

CODES	DATE OF HEARING	DATE OF APPROVAL	EFFECTIVE DATE
*Iron and steel	July 31	Aug. 19	Aug. 29
†Automobile manufacturing	Aug. 18	Aug. 26	Sept. 5
Steel castings	Sept. 7	Nov. 2	Nov. 13
Valve and fitting	Sept. 18	Dec. 16	Dec. 21
Industrial supplies and machinery	Sept. 27	Oct. 23	Nov. 2
Machine tool	Oct. 2	Nov. 8	Nov. 19
Malleable iron	Oct. 2	Nov. 27	Dec. 7
Fabricated metal products	Oct. 5	Nov. 2	Nov. 12
Construction machinery distribution	Oct. 9	.....	.....
Non-ferrous ingot metal	Oct. 13	.....	.....
Reinforcing materials	Oct. 23	Nov. 27	Dec. 11
Anti-friction bearing	Oct. 24	Dec. 25	.....
Machine tool distribution	Oct. 27	Nov. 27	Dec. 8
Non-ferrous foundry	Oct. 27	.....	.....
Structural steel	Oct. 30	.....	.....

* Extended to May 31 by Presidential order of Nov. 21.
† Extended to Sept. 5 by Presidential order of Dec. 18.

Whirligig

By L. W. MOFFETT
Washington Resident Editor, The Iron Age



time President. Indeed, Mr. Roosevelt was not looked upon as a "peace-time" President. Rather he was looked upon as a President armed to make war upon depression.

Hardly had he awakened after his first night in the White House until he declared a national banking holiday. Lasting eight to 10 days, the holiday served to protect banks against further withdrawals and to suspend gold exports, the latter development being a precursor of our formal departure from the gold standard. Inconvenienced though it was by the holiday, industry welcomed it in order that relief from the extremely serious banking situation might be obtained.

But President Roosevelt, like all his predecessors, saw his honeymoon come to an end. It was some time after the great volume of emergency legislation had been enacted that the country began to realize partially its vast latitude. His supporters, in their zeal, held out the hope for miracles and said the New Deal was looking ahead 50 years. The rising opposition, some, but not all, of a partisan character, branded it variously. Some called it socialism; others, communism, and still others labeled it Hitlerism or Mussoliniism. It continues to go under diverse labels.

Certain it is, the Federal Government has taken powers never before existent over every phase of the nation's economic life and has moved strongly toward the left, at least when related to its past position. Put briefly, though entirely inadequately to cover such a broad program, the New Deal aims to end deflation, get inflationary action, raise prices, redistribute income and reemploy the idle, in the shortest possible time.

A Prophecy Fulfilled

The prediction that labor would stand out as the predominating source of controversy over administration of the Recovery act has been fulfilled—most "strikingly" fulfilled. Long before the legislation was enacted, a campaign of unionization was begun and it became intense after its passage. No figures have been given out, but it is estimated that the American Federation of Labor is now up to its war-time strength. This, after the federation's membership had declined to its lowest ebb since it had attained proportions sufficient to make it a voice in industry.

The recognition given to labor is justified on the grounds that industry has been given the right to cooperate under Governmental sanction—under the aegis of Governmental "partnership" as sponsors of the Recovery act termed it—to chase the chiseler and the sweatshop, to "stabilize" prices, to control production, to establish its own trade practices through code authorities or other agencies represented by trade associations.

Charges that the powers given the government over industry are socialistic, dictatorial, and so on, are met by supporters of the Administration program with the declaration that the old order of economic individualism had broken down, that times were desperate, that the stress and strain de-

Working Codes in 1933

CODES	DATE OF HEARING	DATE OF APPROVAL	EFFECTIVE DATE
Bolt, nut and rivet	Oct. 31	.....	.....
Alloy castings	Nov. 2	.....	.....
Gear manufacturing	Nov. 8	Nov. 14	Nov. 25
Gray iron foundry	Nov. 9	.....	.....
Foundry equipment	Nov. 10	.....	.....
Diesel engine	Nov. 22	.....	.....
Scrap iron and steel	Nov. 22	.....	.....
Hoist builders	Dec. 4	.....	.....
Steel plate fabricating	Dec. 5	.....	.....
Woodworking machinery	Dec. 6	.....	.....
Saw and steel products	Dec. 7	.....	.....
Canning and packing machinery	Dec. 7	.....	.....
Steel joist	Dec. 11	.....	.....

MYRON C. TAYLOR

manded immediate relief. They have no patience with the view that the Government has been swung over to the left and has established a degree of control over industry that is extreme and dangerous. On the contrary they contend that Governmental moves were necessary in order to stop the drift of the people toward State socialism or worse.

In any case, the Administration program made Washington the focal point for industry, business, agriculture, labor, transportation, from alpha to omega.

There Were No Miracles

All the major measures pushed through the special session of Congress were intended to be interwoven. They were meant to fit together, woofed and warped. The more zealous supporters of the mass legislation, some of them participants in framing it, gave the impression that when fitted together it would become a magic recovery cloth, whose waving would conjure a quick return to prosperity.

This attitude was especially reflected by the brain trusters. It was not the position of President Roosevelt himself. He said there would be no miracles. Nor were there. The pieces got out of order. At times they gave the appearance of an unassembled jig-saw puzzle and to many they remain as such.

The program was so stupendous, Governmental agencies were multiplying so fast, policies were announced and revised with such rapidity that it was not only the public that became puzzled but the different organizations frequently were found to be running counter to each other. Internal dissensions took place, resignations and reorganizations came about, just as has happened in all administrations. The wider scale of these differences and changes was due to the vast proportions of the undertakings.

The slow-moving, dissension-torn, AAA could not keep pace with the fast-moving NRA. The PWA projects could not get under way in time to meet the expectations of the capital goods industries, though effective results became apparent in December. Other Governmental agencies that added to the almost endless array of alphabetical combinations, for whose meaning a glossary is required, met difficulties that have developed lags in their intended progress, a progress that many think will never be fully realized. The NRA-AAA conflict resulted in many of the AAA codes being transferred to the NRA.

Endless Ramifications

To the metal-working and steel industries, as to all manufacturing industries, the most immediately important piece of legislation was the Industrial Recovery-Public Works act.

Leaders in these fields assisted in drafting the act, though not sharing the Administration views on the labor and licensing sections.

As the law approached enactment, trade associations organized in an effort to prepare themselves and their industries for the tremendous task of codifying that lay ahead. Bringing a complicated industrial machine of a nation like the United States under set standards was readily recognized as a huge undertaking. But it is doubtful if the titanic task was fully comprehended. And as the work goes forward endless ramifications are developing and will probably continue to a degree not even remotely anticipated.

This thing of fixing "law merchants," for steel, and for the metal-working machinery, all down the line

Comment of Myron C. Taylor

"I SEE no reason why the steel industry should not go on under the code or under some similar arrangement. The right which we now enjoy to cooperate in a fair and reasonable manner is all that the steel industry has ever asked. This code, like all codes, is giving that privilege a trial. It gives us an opportunity to make an experi-

Details of Some of the

THAT the inside of some of the emergency measures may be seen, with their strong Government dominance and control, some of the highlights of specific acts may be cited as follows:

Emergency banking act: Stringent control over the gold supply, including authority to prohibit gold shipments and private hoarding of gold; extensive Treasury control of all operations of member banks of the Federal Reserve system; reorganization of closed banks in accordance with a Bank Conservation act; issuance of preferred bank stocks to which the Reconstruction Finance Corporation was authorized to prescribe; issuance by the Federal Reserve banks of new circulating notes secured by Government bonds or by suitable notes, drafts, bills of exchange or bankers' acceptances; permission to expand Federal Reserve credit to member banks and for Federal Reserve loans to any individual, partnership or corporation.

Inflation (Thomas) amendment to Agricultural bill sponsored by the Administration: Gives President broad discretion to use, whenever he might find such action necessary to protect the value of the currency or to expand credit, any of the following alternatives—Federal Reserve open market operations in Government securities up to a $3,000,000,000 maximum; issuance of up to $3,000,000,000 of United States notes to be used to repay maturing Federal obligations or for purchasing outstanding bonds and to circulate as legal tender; to regulate the weight of the gold dollar and fix the ratio of gold to silver, and to provide for the unlimited coinage of gold and silver; to accept silver in payment of war debts up to a maximum of $200,000,000, to be used as the basis of additional certificates. (A further measure to invalidate the gold-payment clause in all public and private contracts was introduced on behalf of the Administration and was passed.)

Railroad legislation, creating Federal coordinator of transportation to "encourage, promote, or require action on the part of carriers, in order to avoid duplications of service, prevent waste and encourage financial reorganization."

Home Loan act: Created Home Owners' Loan Corporation under supervision of Federal Home Loan Bank Board, for refinancing debts on small homes. Treasury authorized to subscribe up to $200,000,000 capital stock of the corporation, which was authorized to issue bonds up to $2,000,000,000 to be used in home mortgages.

Agricultural Relief act: To increase purchasing power of farmers and consumption of articles manufactured in industrial communities and at same time to relieve pressure of farm mortgages and to increase the asset value of farm loans made by banks. When President described his measure in these terms, he referred to the bill as "a new and untrod path," adding that "an unprecedented condition calls for the trial of new means to rescue agriculture" and that "if a fair administrative trial of it is made and it does not produce the hoped-for results I shall be the first to acknowledge it and advise you." Broad powers given Secretary of Agriculture to use any of several alternatives in attempting to control various agricultural commodities, such as licensing of farm lands to take them out of production making marketing agreements with processors, etc., using allotment plan of production control and licensing processors and producers.

To assist in financing the program the act authorized levying a processing tax upon any

on the Steel Code

ment in cooperation and to seek some permanent plan of common action fair to all concerned — to stockholders, to workers and to the consumer and the public. Under the code we have a chance to evolve something that will relieve the industry of the old suspicions and restraints and wastefulness that have so long hampered it."

to the cinders, ashes and scavenger industry—and the latter really is being codified—is an undertaking of such magnitude that, its supporters to the contrary notwithstanding, many think it can never be accomplished entirely. Apparently the original intention was to limit the activities to the more important industries and to deal chiefly with maximum hours of labor, minimum rates of pay and with unfair competition. The first NRA bulletin indicated this was the intention. Likewise, debates in Congress gave the same implication. Eliminating unfair competition, however, was found to cover such a wide field that codes instead of being simple declarations were, with few exceptions, drafted with a wide range of trade practices. Some provided for price-fixing, notably in the raw resource industries; others with control of production—the steel code putting a curb on new blast furnace, Bessemer converter and open-hearth capacity; others limited new machinery installation, except for replacement, as in the case of the cotton textile code.

Four Million Are Returned to Work

It is therefore quite understandable that the NRA did not realize original plans. The hope had been that all industries would submit codes by Sept. 1 and all would be codified by the end of the year. How wide this was of the mark is reflected in the fact that of some 1200 codes submitted only 150 had been given Presidential approval and only 270 hearings had been completed up to Dec. 15. This, despite the hustle and bustle of industrialists, and the high-pressure activities of the NRA, with an organization of some 2000 employees occupying one entire floor and parts of other floors of the huge Department of Commerce building, covering two solid blocks. Nevertheless, the codified industries do represent the bulk of employment.

CHARLES M. SCHWAB

It had been hoped to return 3,000,000 unemployed to work under the Industrial section of the act and 1,000,000 under the Public Works section by Oct. 1. In addition, it was expected that 3,000,000 more would be put back to work by that time through "sympathetic activity in occupational channels" following the release of purchasing power built up under operation of the law.

Actually, up to Nov. 1, a total of 4,000,000 had been returned to work, according to NRA claims. This was indeed a sizeable showing, even if not up to the expectations. NRA took credit for the showing, and its officials scoffed at those who contended it had taken undue credit, or further, that it had really retarded recovery. These figures of course do not take the 4,000,000 CWA workers into account.

Perhaps a fairer appraisal has it the Government's program did set up an improved psychology and that it was responsible for returning many to work. Yet to say the Recovery program was the only source of improvement, which, after all, has been painfully slow, is an assertion that is not unanimously shared. There are many who think the inspiring radio addresses made by the President soon after taking office were in themselves so confidence-begetting that business and industry would have gone along under its own toward recovery. Certain it is that industrial production had dropped to its low point in March and rose rapidly up to July, 1933, when it reached its highest peak since January, 1930. The rise was partially due to speculation and anticipation of higher prices. Recession followed until about mid-November, when a moderate upswing set in. The rising curve

Recovery Legislation

commodity selected for control equal to difference between current farm price of the commodity and prices necessary to restore pre-war purchasing power. The Secretary of Agriculture was empowered to set up an Agricultural Adjustment Administration to carry out detailed execution of the act. Added to the act was the President's recommended farm mortgage legislation, authorizing various steps to enable the Federal Land Bank system to function more widely, to reduce interest on farm mortgages held by Government agencies and to postpone foreclosures, to liquidate gradually joint-stock land banks and to authorize certain additional agricultural financing by the Reconstruction Finance Corporation. Federal Land Banks were authorized to issue up to $2,000,000,000 of new Federal farm-loan bonds and $300,000,000 was added to lending power of R. F. C.

Muscle Shoals and Tennessee Valley Authority: Previously vetoed by President Coolidge and President Hoover, legislation was pushed through by President Roosevelt setting up a Government agency to control the Muscle Shoals properties and the development of the Tennessee River drainage basin, covering power, fertilizer production, etc.

Securities act: Provides for Federal supervision of inter-state traffic in investment securities. In recommending the legislation, President said that, in spite of State laws, "the public has sustained severe losses through practices neither ethical nor honest on the part of many persons and corporations selling securities." Further he urged that the Government should make certain that new securities will be accompanied by "full publicity and information" and that the "ancient rule of caveat emptor" should be supplemented by "the further doctrine 'let the seller also beware.'" The legislation was described as only one step in protecting investors and depositors, to be followed by legislation to better supervise transactions on exchanges and to correct "unethical and unsafe practices on the part of officers and directors of banks and other corporations." The act requires that in connection with all new securities (except certain Federal, State and municipal issues) full information must be filed with Federal Trade Commission. Commission is empowered to stop issues not made in compliance with act. Officers of companies are made personally responsible in both criminal and civil suits in case of misinformation. Similar restrictions were imposed upon flotation of foreign securities in United States.

National Recovery act: Administration measure sponsored by Senator Robert F. Wagner of New York to replace previous measures, including Black and Connery 30-hr. week bills. Though giving President almost unlimited power over industry, the act was drafted through cooperation with prominent industrial associations and leaders, together with labor leaders. It shortens the work period, increases wages, improves labor standards. Though called "highly socialized," the act was hailed by industry because it was given privileges of cooperation not enjoyed since passage of Sherman anti-trust law. Reputable trade associations were elevated to importance never before attained, in preparing codes, providing for elimination of unfair competition, to govern entire industries. Nevertheless, many industries object strongly to the charter given labor, which was granted privileges it never before enjoyed, to bargain collectively through representatives of their own choosing.

JOSEPH B. EASTMAN

undoubtedly was due in part to the fact that PWA projects began to reach mills and factories. Mixed with this situation, however, were uncertainty and delay over NRA codes and policies, especially regarding labor, with constant disputes and strikes. In addition, the President's gold purchase and general monetary policy created a furor, one that may develop a schism within the Democratic party. Hot words were exchanged, "Tories" were assailed, and the country reacted nervously.

Likewise there was an "epithetical" era raging, especially in October and November, between the NRA and its critics. Attacks on the NRA were met by piquant, barbed words and phrases, with General Johnson and Mr. Richberg leading the onslaught against those who essayed to criticize the NRA. Much of the criticism was of a partisan character, but it is also true that much of it was fair. The intolerant spirit in which it was received did not help the NRA cause along.

The fact remains, however, that after these outbursts had been delivered, a better feeling set in and it is perhaps accurate to say that NRA stock began to rise early in December. Subsequent proceedings against the Weirton Steel Co., which opposed union labor control again aroused many industrialists.

It Began in June

The saga of the code began soon after General Johnson set up his big organization early in June. Industry was perplexed by his announced policy of raising wages first and prices later. Industry contended that it was a mistake to attribute curtailed buying power to the rate of industrial wages. Instead, it urged that the difficulty lay in the low prices of agricultural products and the almost prostrate condition of the capital goods industries which, when operating normally, are estimated to account for about one-half of the nation's industrial employment.

While there was complaint that the basic industries were slow in presenting codes, the fact remains that the code of the American Iron and Steel Institute was submitted to the NRA on July 15, lacking one day of a month after the act was passed. It was stated by General Johnson himself at a press conference on June 20 that the steel industry was working as hard as it could on its code. So were hundreds of other industries, including the metalworking group. Most of the industries of the nation quickly and even enthusiastically were seized with "coditis," and began to swarm into Washington, to which all roads and codes led. The hotels, the NRA and downtown offices became a hive of hectic activity.

DONALD R. RICHBERG

Huddles without end, code-drafting by the wholesale, spats back and forth as the difficult jobs were undertaken in the hot, sweltering Washington weather, became the order of the times. And while the high-tide of these activities has passed, they remain plentiful. No doubt they will last for many a day before the job is done, if it is ever done completely.

The Blue Eagle Is Hatched

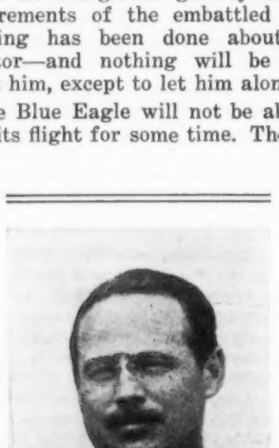
It was soon seen that it was impossible to codify the nation so quickly as the NRA had hoped. No matter how hard industrialists worked, no matter that the big NRA organization, with many prominent industrial, financial and economic figures, worked almost night and day, wearied and worn, scornful of codes for themselves, the high-pressure effort was in vain so far as the quick results were concerned. General Johnson saw this development with some misgiving. He predicted the air soon would be full of dead cats. Something had to be done quickly to satisfy labor, straining at the leash for action and to go into action. It was demanding hasty application of the purposes of the Recovery act. But labor was not alone. The country was wanting something done at once.

Hence the now famous Blue Eagle. Late in July General Johnson flooded employers with 500,000 telegrams to bring them under a blanket agreement for shortened hours and increased wages. This is known as the President's Reemployment Agreement. A remarkable response was made to General Johnson's appeal. The agreement is a forerunner to codes. When industries are finally codified they no longer operate under the President's Reemployment Agreement.

The principal holdouts against the NRA were Henry Ford and Senator Carter Glass, stalwart gold-standard Democrat, who publishes a daily newspaper in Lynchburg, Va. General Johnson attempted to "crack down" on Mr. Ford. But the more he "cracked," the higher Ford sales went. And finally in a tussle to deprive Mr. Ford of Government business, the Controller General of the United States held that Mr. Ford was eligible to Government contracts and one of his dealers near Washington was awarded a healthy-sized piece of business for the CCC.

The fiery Senator from Virginia from the outset scorned the Blue Eagle and will have nothing to do with it, though wages paid and work hours he recognizes go beyond the requirements of the embattled bird. Nothing has been done about the Senator—and nothing will be done about him, except to let him alone.

The Blue Eagle will not be able to take its flight for some time. There is



MALCOLM MUIR

too much codifying to be done. This meant that extension of the PRA was necessary. The act carries no provision for the PRA. It is a voluntary agreement—with Governmental pressure back of it. It is also true there is much public support back of it. But it did not go to the extent of

proving "economic death" where it has been unheeded or even where it has been taken away from those who had flown the bird. This is not to say that the conception of the PRA was not sound. On the contrary it was, but the public evidently felt that drastic methods had been employed in some cases which were not justified. The chief applause for the Blue Eagle was occasioned by its drive against sweatshops and unconscionable hours.

Steel Industry Withdraws Open Shop Clause

The steel code hearing took place before General Johnson, and Deputy Administrator K. M. Simpson on July 31, and attracted a large crowd. The magnitude of the industry itself appealed to the public, as did the newness of the proceeding. But far more important was the attitude of the industry toward organized labor, whose leaders appeared in full force, with President William Green of the American Federation of Labor acting as the labor adviser on the code. The open shop declaration in the code was the especial *bête noire* for organized labor. It was determined to have it thrown out. And thrown out it was after General Johnson and General Counsel Richberg attacked it.

In a dramatic moment, R. P. Lamont, as president of the American Iron and Steel Institute, who presented the code, had said he anticipated the objection to the clause, and felt it could be removed without materially altering the code. The hearing was adjourned a few minutes while the directors held a meeting and confirmed Mr. Lamont's recommendation. This met with cheers from the labor leaders and congratulations from Miss Frances Perkins, secretary of labor. Mr. Green asked for the standard 30-hr., five-day week for the steel industry, and equal representation for the federation with the institute in an Advisory Council on Industrial Relations. He also asked for higher wages than the code provided. Miss Perkins asked for shorter hours and higher wages, also but not so "short" and "high" as Mr. Green advocated.

The "Walkout" On Green

These issues were the source of sharp discussions from Aug. 15 to Aug. 18 between NRA officials, including General Johnson, Mr. Simpson and Mr. Richberg, together with Miss Perkins. The conferences, lasting long hours of the day and night, shifted from Miss Perkins' office to General Johnson's offices and became intense at times. At one point of the first day's wrangle, Mr. Green made his appearance at the office of Miss Perkins. The steel executives staged a "walkout," the first under the NRA. Miss Perkins tried to mollify them, but they declined flatly to negotiate with Mr. Green.

Later General Johnson said that Mr. Green was not the labor adviser on the steel code, in which position he said he had appeared at the conference. The general said Miss Perkins was the labor adviser and had been sent to steel-producing areas to acquaint herself with labor conditions in the industry. It developed, however, that Mr. Green had been selected as labor adviser on the code. During these conferences, both Myron C. Taylor, chairman of the United States Steel Corpn., and C. M. Schwab, chairman of the Bethlehem Steel Corpn. called at the White House and conferred with the President, apparently about the temporary deadlock over the steel code. Finally the deadlock ended, the code was changed but little and it was approved by the President on Aug. 19.

After one parley with the steel executives, General Johnson, tired and irritated, rushed from the conference room and as he was met by press representatives to get the "low down" on

K. M. SIMPSON

the meeting made it evident that the going was rather rough. General Johnson referred to the steel executives as "wildcats." There was, however, a tone of humor in the general's voice. For just as he has an abundance of biting phrases, the general also is well supplied with a sense of humor and it has proved a saving grace. Otherwise it is doubtful if he could have survived the tremendous mental and physical strain he has undergone.

Labor Difficulties Multiply

The withdrawal of the open shop declaration from the steel code, however, was rated as a victory for organized labor and it saw the issue of labor growing from that period on. On Aug. 23 the general officially banned the words "open shop" and "closed shop" and said the labor section of the law could not be changed by interpretation. It was declared to be the function of the Administration and the courts to apply and interpret

EUGENE G. GRACE

the labor provisions. Endless controversies and rulings over the labor clauses followed. The President wrote a statement to General Johnson late in October on the subject. In substance the Chief Executive forbade insertion of any interpretation of the labor provision (Sec. 7a) of the Recovery act because he said it "leads only to further controversy and confusion." Nevertheless, he added that there is nothing in the provisions of Sec. 7a "to interfere with the bona-fide exercise of an employer to select, retain or advance employes on the basis of individual merit."

A "merit clause," however, did get into the automobile manufacturing code, approved in August, because producers insisted upon it and because, as General Johnson said, he let it get by "in an unguarded moment." However, the code, which expired Dec. 31, was extended without change until Sept. 1, 1934.

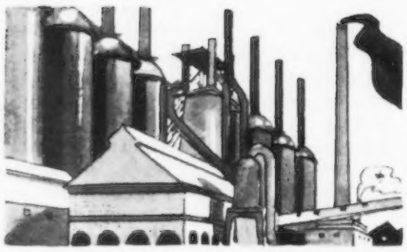
As August neared its end, "dead cats" appeared. They started with the resignation of Dudley S. Cates, Assistant Recovery Administrator, who held out for the vertical union. Organized labor said Mr. Cates favored the company union. From this point on, with varying degrees, criticism was directed toward the NRA and the battle of words lined up with the battle of the codes. Running through from that time up to the present were rows over the labor issues, with strikes penetrating steel plants, though not extensively; captive and commercial coal mines, automobile plants, plants of tool and die makers, textile mills, etc. They reached proportions beyond any since 1921. Organized labor grappled with industry over the right of unionization—based on the right of collective bargaining through their own representatives. Conference after conference was held with steel executives at the White House, with General Johnson and with other officials, and are of such recent history—some of the history is still in the making and will

be for a long time—as not to require detailed recital.

Capital Goods Industry Recognized

The necessity of a capital goods movement as a means of stimulating recovery began to receive recognition early in September and was given attention by President Roosevelt, General Johnson, Public Works Administrator Harold L. Ickes and Federal Transportation Coordinator Joseph B. Eastman. This movement developed into sizeable proportions through loans from the PWA for railroad and construction projects, supplementing funds supplied for Federal, State and municipal projects. Though the projects moved more slowly than could be desired, they began to be felt effectively in the way of steel and metal-working machinery orders toward the end of the year. The Administration made it known that the $3,300,000,000 PWA fund was inadequate, and more funds, perhaps another billion dollars or so, will be added to this outlay, some to be returned in full by borrowers, but 30 per cent of which is an outright grant for State and municipal projects. The taxpayer is heading into tremendous levies.

That rehabilitation of the durable goods industries was the "only medium for permanent expansion in consumer purchasing power" was the opinion expressed at code hearings by John W. O'Leary, president of the Machinery and Allied Products Institute, which has presented a large group of metal-working machinery codes. A like insistence has come from the metal-working manufacturing industry generally, and the view has never been disputed. Malcolm Muir, divisional deputy administrator, has repeatedly made the same point. The movement for purchase of metal-working machinery has not reached anything like its potential proportions, but is gathering headway. Mr. O'Leary has said that it



would take about $30,000,000,000 to replace equipment obsolete at the end of 1932 to make up deficiences in purchases during 1930-32 as compared with the 1919-29 average.

The Effect of Codification

It is not possible to say with exactitude what effect codes have had on industries. Steel, steel castings, coal, lumber, cotton textile and other industries which have reported have praised the codes for their beneficent effect in eliminating unfair methods of competition, stabilizing markets and generally setting up improved trade practices. The cost in increased wages is mounting, however, and unless business volume expands sufficiently, it is a problem how some industries will be able to continue their hour and wage schedules. Others, however, have reported profitable operation under codes.

In its report of Nov. 16 to the President of operations under its code, the American Iron and Steel Institute said that payrolls had increased $9,000,000 monthly while 92,000 employees had been added. At the request of the institute, the President extended the code to May 31, 1934.

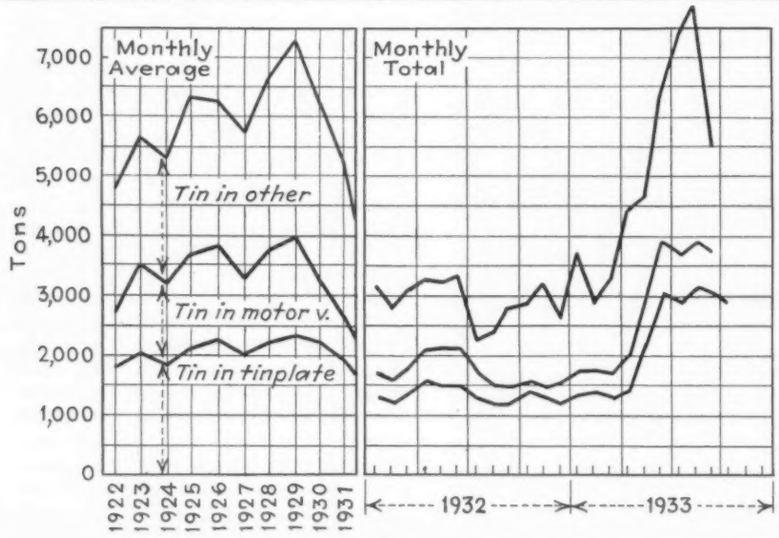
It was considered significant that organized labor made no protest whatever to extension of the steel code. So far as is known, it made no request for changes in hours or wages. This was taken to be a realization by organized labor that the steel industry already is straining itself under the code and that further concessions would only close down plants and thus increase rather than reduce unemployment.

Organized labor, however, will no doubt make its usual plea at the Congress just assembled for the 30-hr. five-day week, but knowing that it is only something for an undetermined future. General Johnson has said that the 30-hr. week at this time would bankrupt industry. It is probably clear that organized labor leaders have the same view without advertising the fact.

Organized Labor Gains Much

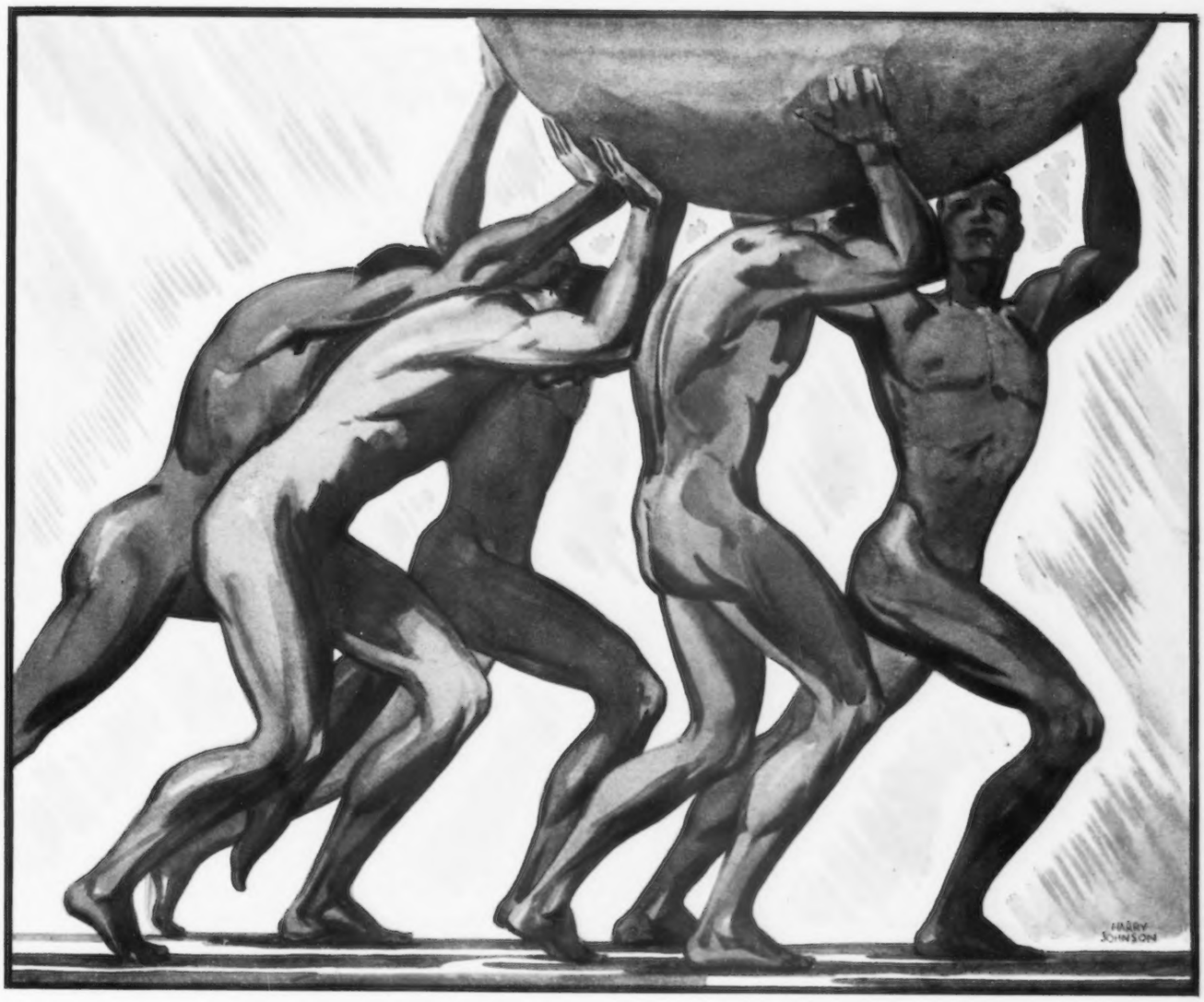
Labor has made great strides under the Recovery Act, getting larger benefits than industry. It has leaders who plainly see it should not overreach itself. Meanwhile it is driving for more representation in code administration. It found itself divided as to whether it should be represented on code authorities and has without regret given up that plan. But it, no doubt, will get greater representation on boards, both within industries and under direct Governmental jurisdiction.

What modifications may come about in codes later is patently unknown. But the New Deal has set up a new economic system, and whatever may be its endurance as it now stands and is proposed, it seems clear that industry is permanently headed into a greater cooperative movement. And for this privilege it will have to face labor. While organized labor is opposed by many in industry, it is also true that many industrialists do not have the misgiving on the issue that they once had. This is especially notable in reports on operation of the bituminous coal code. There still is an element bitterly opposed to organized labor, but there also is a once-hostile element now entirely reconciled to organized labor. Much, no doubt, depends on the behavior of both industry and labor.



Consumption of Tin in the United States

THE accompanying chart of the consumption of tin in the United States is taken from a statistical bulletin issued in November, 1933, from the New York office of the International Tin Research and Development Council, 149 Broadway. For the years covered, the records show that for every ton of tin used in babbitt metal 1¾ tons were consumed in solder and 3¼ tons for tin plate. Tin plate took 36 per cent of the total tin consumption and the motor vehicle industry about 21 per cent.



MATERIAL HANDLING

There ***are*** giants in these days,
Giants far more powerful than those of legend,
Giants who take the burdens of industry from men's shoulders,
Who lift with unlimited strength,
Who carry with amazing speed,
Giants who faithfully serve our industry day by day,
Indoors and out, in heat or in cold,
Never faltering, steadily pushing forward,
Performing Herculean tasks without number.

MATHEWS PRESENTS

A BOOK OF ADVANCED THOUGHT ON CONVEYERS

FOR STEEL AND METAL-WORKING EXECUTIVES AND ENGINEERS

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CONTENTS

This seventy-four page book with its brief copy and liberal number of photographs describes installations of:

COIL CONVEYERS • MATHEWS "HERRINGBONE" LIVE ROLLER FURNACE RUN-OUT CONVEYERS RETURN PACK CONVEYERS • SHEET PACK CONVEYERS • FURNACE LOADING CONVEYERS • BALL TRANSFERS • MATHEWS 90-DEGREE TWISTED ROLLER SPOUT • LIVE ROLLER CONVEYERS • TWO-WAY WHEEL CONVEYER FURNACE RUN-OUT SWITCHES • TILTING MECHANISMS • COIL UP-ENDERS TROUGHED TYPE ROLLER CONVEYERS • POWER OPERATED ROLLER CONVEYER SWITCHES • PIPE HANDLING CONVEYERS • RUN-OUT AND COOLING TABLES • BRICK ELEVATORS AND CONVEYERS Specifications and detailed drawings of HEAVY DUTY GRAVITY ROLLER AND WHEEL CONVEYERS

IN presenting this new book to the Steel and Metal-working Industries it is our purpose to lay before the executives and engineers in charge of production advanced thought in the form of photographic illustrations and suggestions showing Mathews Conveyers in this field.

We invite those responsible for the handling of materials to write

for a copy of this work. Your request may be directed to either our main office and factory at Ellwood City, Penna., or to any of our twenty-seven sales offices thruout the United States and Canada.

Mathews Conveyer Company, Ellwood City, Penna., Mathews Conveyer Company, Ltd., Port Hope, Ont., Canada.

Materials Handling Progress During 1933

By JOHN A. CRONIN
Secretary, Materials Handling Institute

THE materials handling industry, like all of our capital goods industries, has suffered from the depression dwindling of investment funds. The volume of business in this industry has been severely curtailed but the initiative of the industry has gone marching on, as demonstrated by its record of engineering progress during 1933.

The increase of manufacturing costs, brought about by the higher wages and shorter hours of the codes, has had a marked effect upon this industry during the past few months. It is gradually coming back "into its own" as harassed manufacturers, faced with higher costs seek to obtain offsetting economies.

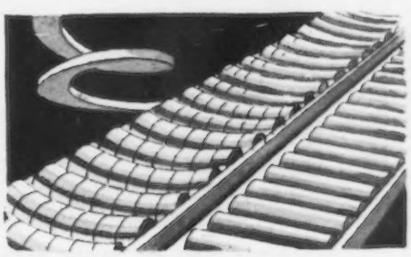
It has been said that industrial operations under NRA, will automatically compel the rehabilitation of plant equipment under the spur of the necessity of cost reduction. So far as the materials handling industry is concerned, this theory is already bearing fruit. The coming months should be profitable and busy ones for all makers of cost reducing equipment.

NO accurate report of "Materials Handling Progress" could be prepared unless the author took into primary consideration the mass movement toward social betterment that has gathered momentum during the past year, and the part that economical and efficient materials handling methods and equipment play in the practical realization of the aims of the movement.

For this reason, as the most important single contribution to progress in this industrial activity for 1933 this writer casts his vote for the special bulletin prepared by the Division of Industrial Hygiene of the New York State Department of Labor. This bulletin is entitled, "Handling Material Accidents—Their Cause and Prevention;" some of the data contained therein will be amazing, not only to employers in general, but to the manufacturers of materials handling equipment as well. In the many years during which the writer has been associated with the materials handling industry, he has been firmly convinced, from practical experience and from observations, that properly applied materials handling equipment and methods are a boon to both employers and employees; but he never had anything more than an approximate idea of the excessive waste in life, in health and in money that originates in failure to provide means of serving labor and of releasing workers from the burdensome, back-breaking toil of yesteryear.

In the first of a series of tables included in this document, we find that during a single year, 1932, there were no less than 23,735 accidents in New York industries which occurred in materials handling operations. There resulted no less than 77 deaths and 15 "permanent total injuries." In addition there were 3901 "permanent partial injuries" and 19,742 "temporary injuries." The total amount of compensation paid as a result of these injuries and deaths amounted to $5,009,170.

In the summary is written a sermon more powerful than many writers of "Progress Reports" could prepare: "In the whole field of industry there is no place where safety and efficiency are so intimately associated. The same effort which makes the handling of goods less costly also makes them safer. This provides an especial reason why the employer should give this subject far more attention than it has received. Profits are made by skillful purchases, careful manipulations and expert salesmanship but they are often lost at a hundred points in the factory by unskillful handling and the delays, breakages and damages that occur to the material, as well as the injuries to the worker."

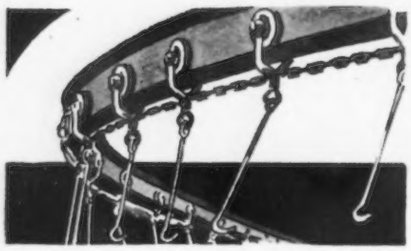


The Industry is Improving

While the monetary rewards to the manufacturers of material handling equipment have not been large during the past year, business generally in the various lines within this industry has been greatly improved as compared to the very discouraging previous year. In spite of the difficulties which were encountered, the industry as a whole made good use of the slack times to produce new designs and to make such improvements in their machines and accessories as would make them more serviceable.

Naturally the reopening of the brewery and liquor industries was reflected in the development of new units of handling equipment, as well as in the broader application of certain existing types of equipment which has proved its value in other industries where the handling problems were similar. Likewise, the governmental program of public works presented some problems in handling which brought equipment to fit the requirements.

On the whole, progress of the past year was just as much in new applications of old materials handling equipment and methods as it was in the development of entirely new machines and methods. For several years the importance of efficiency and economy in distribution methods has been stressed in many directions; the past year has witnessed the introduction on a broad scale of store-door delivery and the study of the interrelationship of the various means of transportation, with the Federal government leading in a search for factual data that will, it is hoped, result in a bet-



ter integration and greater coordination of all arms of our transportation service. While this study is not yet sufficiently advanced to warrant any definite predictions of the final results, it is quite probable that the near future may bring widespread application of the most modern materials handling methods for handling all classes of freight, particularly the variety known as LCL.

Some of the New Developments

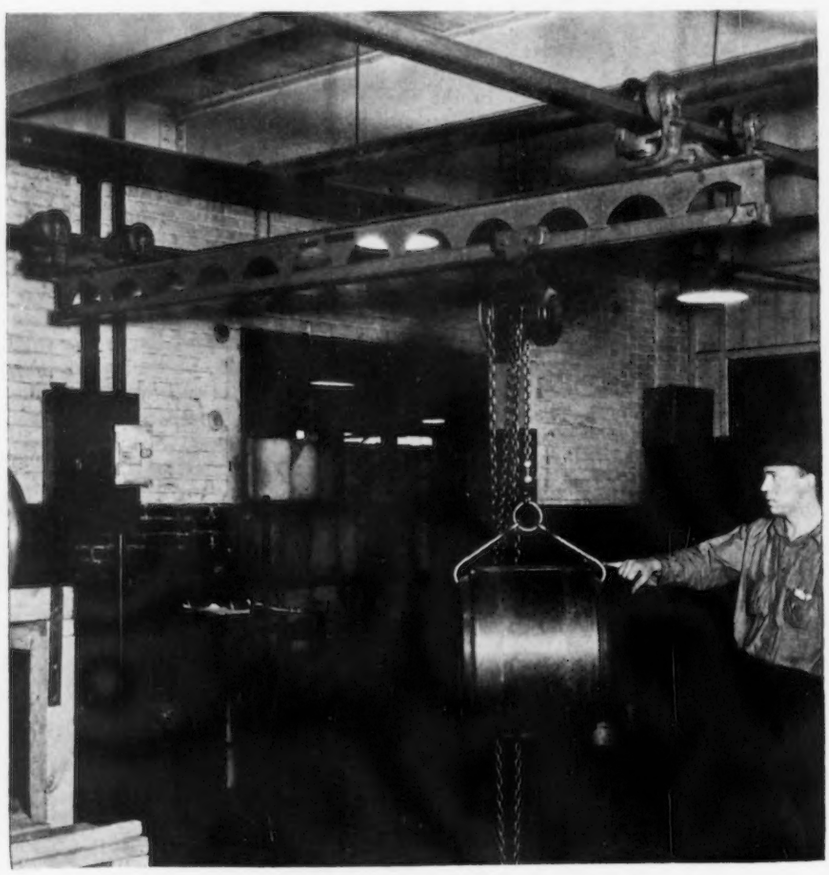
Several items of new equipment have particular application for the metal-working industry's handling problems; others are of more general application. New models of, or refinements in, both gas and electric industrial trucks, industrial tractors, hoists, monorail and conveying equipment, and floor trucks and casters have been announced during the past year. In general these improvements are presented as cost reduction devices. An increase in the application of the photoelectric tube to materials handling equipment has been noted. There has probably been less activity in the heavier types of equipment, but even in these there has been some progress made. All in all, the materials handling industry can be proud of its achievements during 1933.

One of the outstanding developments for steel handling is a machine, built by the **Ross Carrier Co.**, Benton Harbor, Mich., for handling steel sheet. It has a capacity of 10 tons and is used for the transportation and tiering of finished cold or hot rolled sheets in and about steel mills. It is used for transporting sheets from rolls to scales and from scales to car door, and for the carrying of the sheets between craneways. Its features include a power-operated transverse lift hook mechanism which enables it to handle bundles of any width from 12 in. to 5 ft. 7 in. It can handle sheets of almost any length and can tier them having a length not greater than 10 ft. to a height of 6 ft. One of these machines is said to have handled approximately 800 tons of sheets every 8-hr. shift. This manufacturer has also introduced a new gas-powered stevedore machine, which will handle a platform load of canned goods 10 ft. high, or a load of 50-ft. timbers or of other cargo. In general it resembles the type of carrier which has long been recognized as an efficient lumber handling unit.

Mercury Mfg. Co., Chicago, announced two new gas-powered units during the year. One is a small "Banty" gas tractor, an extremely short, compact tractor which delivers 1000 lb. drawbar pull in high gear at over five mi. per hr.; it will climb a 20 per cent grade with a 3-ton gross trailing load, at 2.6 mi. per hr. and will start a 66-ton trailing load on smooth, level pavement. Ball bearing steering, full spring suspension, safety brakes and zero pressure tires on the rear wheels are among the features. The other new item is a telescopic tilting fork truck, a machine which is offered either as a storage battery job or as a straight engine driven job, employing the hydraulic principles for hoisting and for tilting the load. It has telescopic action, with a minimum overload of 82 in. The forks lift to a height of 109¾ in. and the capacity ranges from 2500 to 5500 lb.

Atlas Car & Mfg. Co., Cleveland, has developed a truck for handling bundled steel sheets. It is essentially a loading truck with the platform normally in a horizontal plane, permitting loading of bundle direct from cranes to the flat platform of the truck, which then carries the load into the box car and deposits it by inclining the platform and permitting the bundle to slide to the floor of the car. Travel of the bundle is controlled by cables to winches on each side of the platform. The truck may be maneuvred in and out of standard box cars. The unloading truck is of essentially the same design; the platform is inclined at the bundle, which is then pulled onto the platform by means of the winches, after which the platform is tilted back to clear in the running position.

Baker Industrial Truck Division of the **Baker-Raulang Co.**, Cleveland, has announced three developments of interest. One is a heavy-duty fork truck for handling a 5-ton skid load of automotive parts into and out of annealing ovens and for transporting heavy loads where tiering is not required. The load end of the frame is connected to the tandem axle assembly by means of rocker arms and shaft and four sets of heavy coiled springs, allowing independent vertical movement of each wheel. A second machine is a tilting fork truck with telescopic feature providing approximately 9-ft. lift and still able when telescoped to pass through a 7-ft. car door. It is designed for high piling of tin plate in 5000 to 6000 lb. packs. A right and left hand screw adjustment provides variable spacing on the lift forks. The third machine is designed for rapid handling of newsprint rolls from ground level to road truck platform. The lifting member is a knife edge flat scoop equipped with load clamp, which is automatic and balanced and hooked with the lifting device to prevent any lift taking place until the clamp has been closed.



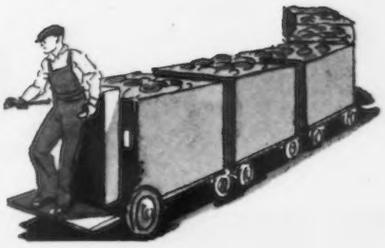
A new crane and transfer bridge produced by Cleveland Tramrail Co.

Lifting speed has been adjusted so as to raise the load to its extreme height in just the time required for the truck to move from its loading position to the unloading position. They are powered with gas-electric units.

Crescent Truck Co., Lebanon, Pa., added to its line a new electric truck for service in hospitals, department stores or wherever the load might average about 2000 lb. This truck is arranged to operate with automotive starting and lifting batteries. It has a General Electric motor driving through a worm and worm wheel mounted on ball bearings and enclosed in an oil tight housing. The wheels are equipped with press-on type automotive rubber tires mounted on Timken roller bearings. The platform size is 33 by 60 in. and is 19 in. high.

The hand lift-truck and portable elevator manufacturers have been active in developing new markets for their products. **Barrett-Cravens Co.**, Chicago, for example, has been pioneering in the application of the portable elevator to bus terminal handling. With the increase in bus and motor coach travel, the baggage handling problem has become a real one for the terminal operators. The trunk, it is said, has come into popularity with coach travelers, who formerly seldom carried along more than hand luggage. The portable elevator makes it simple for one man to handle as many as four trunks and six suitcases at one time, right up to the top of the bus. The company has developed a 500 lb. capacity machine with overall height of 12 ft. and lifting height of 10 ft. 4 in. It is governor controlled and has two hand speeds, a high gear ratio when speed is wanted for cranking the empty platform up to get a load; a low speed is used when it is necessary to crank up loads. A recent installation of tin plate lift trucks and tin plate elevators represents further development in this type of handling.

Lewis-Shepard Co., Watertown, Mass., has developed some interesting equipment during the past year. One item is a crane particularly designed for installing electric refrigerators. This crane can be folded and locked into a compact space for convenient transportation to the point of installation of a refrigerator. It requires only a few seconds to fold or set up. It is equipped with wheels and casters to make maneuvering into correct position a simple matter, and the winch makes lifting of refrigerating units a simple task. Another item for use in handling domestic refrigerators is a new roll truck for lifting and maneuvering a refrigerator box into position. A few easy turns of a handle lifts the truck and three-in. rubber tire casters makes the maneuvering job a cinch. A third item of 1933 development is a tailboard elevator for motor trucks



which can be installed on practically any make of truck. It can be furnished in capacities from 200 to 3000 lb. and with any size lifting platform. The use of this elevator allows containers equipped with casters and wheels, or skid platforms and stock boxes, to be used for interplant and branch shipment. The elevator is furnished in hand power types or in power operated types driven from the motor truck engine.

Yale & Towne Mfg. Co., Philadelphia, has added a new selective multi-stroke lift truck to its Stuebing line. The new truck is designed for handling loads from 3500 to 5000 lb. A variable stroke ratchet provides selective lifting; either four full strokes or sixteen quarter strokes will raise the platform on one model, and either five full strokes or twenty quarter strokes on a second model. It has four-wheel construction, with twin steering wheels in front. Hyatt roller bearings are standard in the all-steel wheels. The truck is all-steel construction with bolted type frame. An automotive type of foot pedal, a complete lifting range of 360 deg., special safety lock and complete standardization of parts are among the features.

W. F. Hebard & Co., Chicago, have made no radical changes in the design of their industrial trucks other than to provide zero-pressure or pneumatic tires, whereas in the past they have furnished them only with the conventional solid rubber tires. This brings to the front the fact that there has been quite a rapid development in the use of pneumatic tired equipment for certain types of floor handling trucks. **Saginaw Stamping & Tool Co.**, Saginaw, Mich., has announced the addition of two distinct types of pneumatic equipped trucks. It is claimed that the cushioning of heavy loads on certain types of interplant handling equipment makes the pneumatic tired trucks attractive to operators in glass factories, potteries and in other industries, and that they increase indoor transportation speed.

Caterpillar Tractor Co., Peoria, Ill., states that its most important contribution to the handling of materials during 1933 was the expansion of its line of Diesel tractors and power units.

International Harvester Co., Chicago, brought out a small industrial tractor for interplant work. The machine's wheelbase is 57 in., overall

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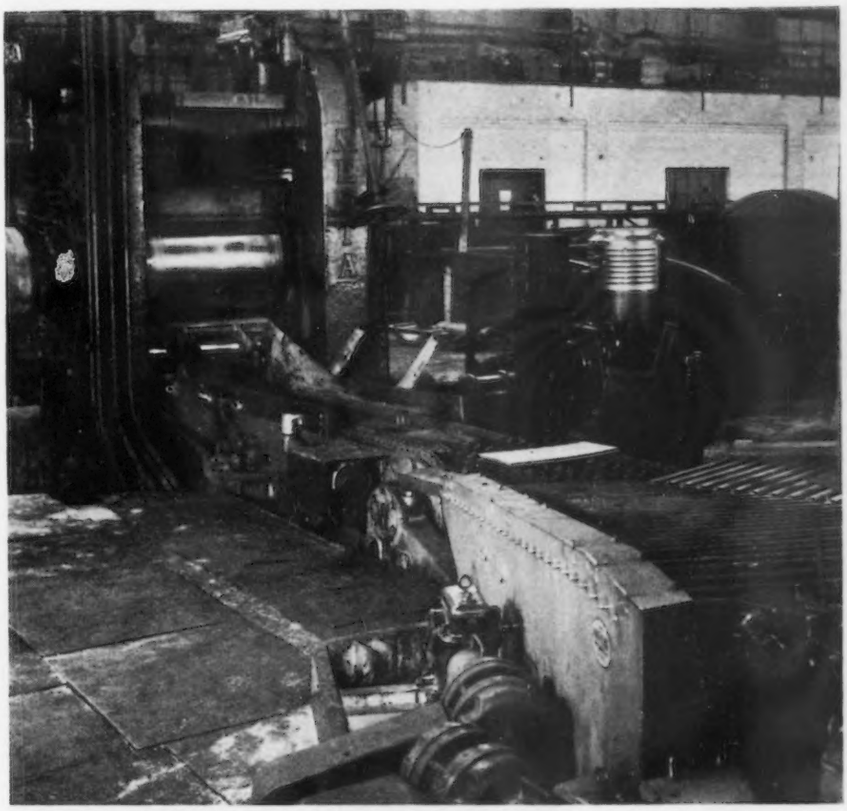
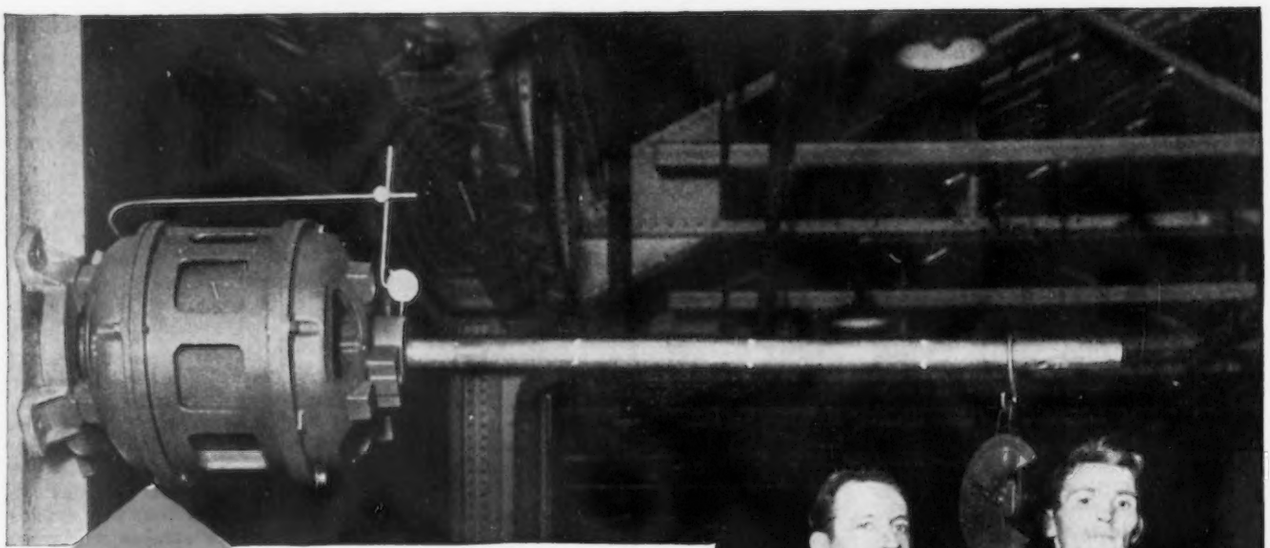
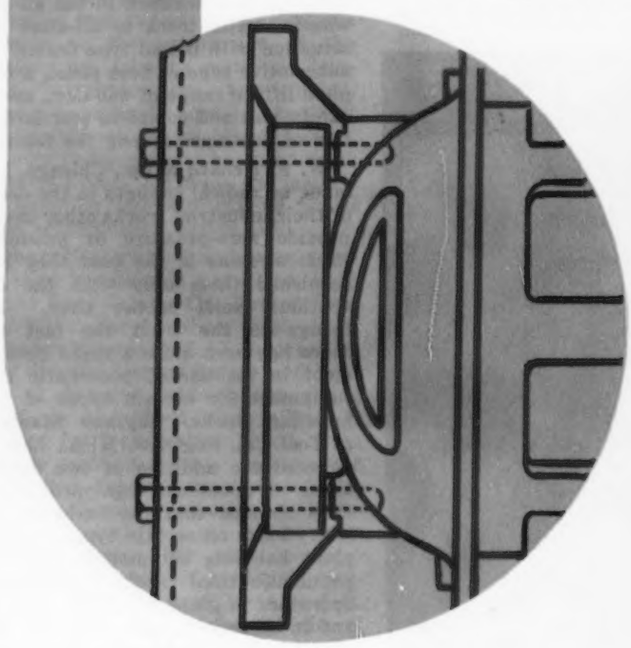


In the right foreground is shown a Mathews "herringbone live roller," furnace run-out conveyor, used in conjunction with other units for producing sheet steel by the "combination" system. Developed in conjunction with the Wean Engineering Co.

AGAIN WE SAY



(Below) Four bolts screwed directly into the motor bracket throw the entire strain of the men's weight upon the motor frame. The bracket, between motor and beam, is simply a spacer.



350 pounds of men—hanging 3½ feet out from this 10-hp. motor bearing—and it sagged less than 2/10,000 of an inch.

"No Sag or Twist in the CS Motor Frame"

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It's a motor's frame that largely determines its *durability and performance.*

The rigid, cast frame of the CS Motor makes certain that the air gap always stays the same—no rubbing of rotor or stator. The bearings maintain their original alignment permanently—the full bearing surface is always effective.

Both machine designers and users can profit from the savings in space and installation costs made possible by this remarkably rigid frame. The illustrations at the right show examples of CS motors frame-mounted on machines—without additional support. They can easily withstand the stress of overhung loads while driving pumps, fans, speed reducers, etc. In fact, on many installations the entire weight of the driven machine is supported by the CS motor frame.

These advantages result only when the motor's frame has the necessary rigidity to resist sagging throughout years of sustained service.

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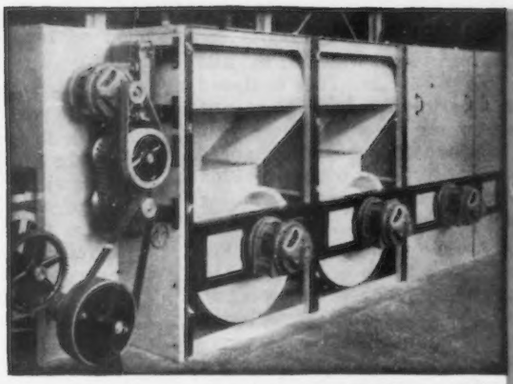
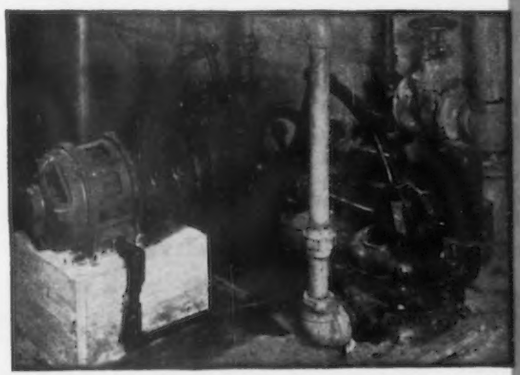
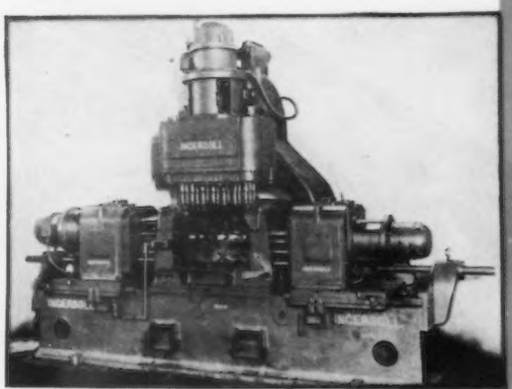


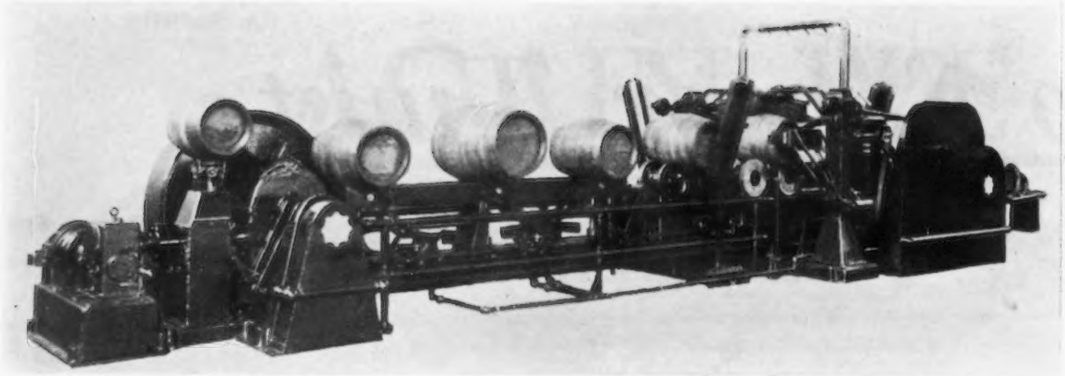
CS motors flange-mounted on a textile dryer. The rigid cast frame makes this mounting practical.



Supported entirely by the CS Motor Frame, this speed reducer constitutes an unusually compact drive for these two diaphragm pumps.



Three CS fan-cooled Motors are flange-mounted on this multiple drill press. The rigidity of the frames alone assures permanent alignment of motor bearings.



Among other 1933 developments of Link-Belt Co. was this fully automatic keg washer. Here we have a striking example of the integration of handling principles, applied for a specialized purpose.

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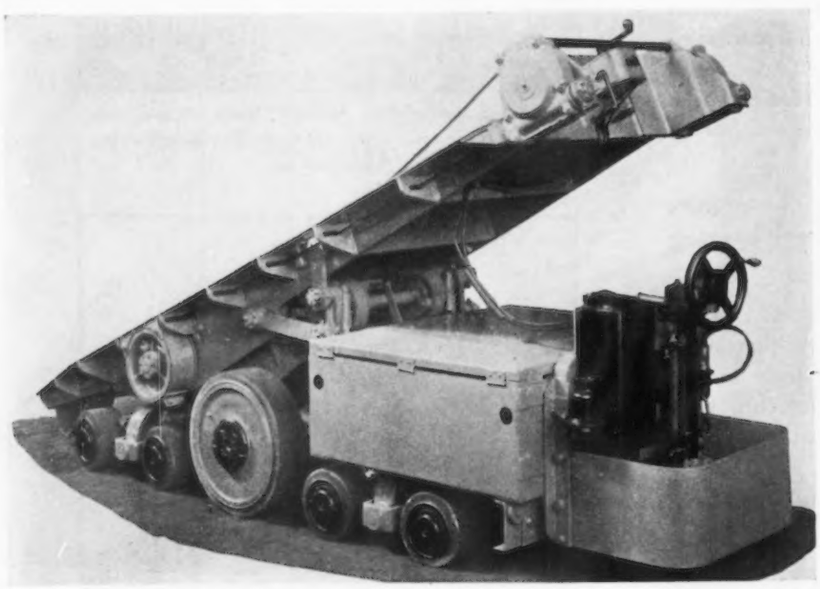
length 96 in., overall width 52 in., and overall height 52¾ in. It is equipped with pneumatic tires both front and rear, is powered by a 3-in. bore 4-in. stroke engine with governor speed change throttle, and with provision for mounting attachments and for front power take-off.

The conveyor manufacturers have not been behind the procession in the progress parade. The writer recently heard of an interesting installation for handling automobile frames, varying in lengths from 10 ft. to 25 ft. and in weight from less than 100 lb. up to 700 or 800 lb. These frames are, by an automatic device, raised from a horizontal position and placed on an overhead conveyor 27 ft. off the floor and spaced 24 in. apart. The conveyor handles five frames a minute, washes the frame with automatic water nozzles, rinses them, dries them, paints them, carries them up into an oven, the roof of which is 60 ft. from the ground, bakes the paint on them, takes them out of the oven to the shipping dock and automatically unloads them from the overhead conveyor to a horizontal apron conveyor.

Lamson Co., Syracuse, N. Y., announced two new developments in 1933, the first a new type of conveyor chain, the second a live roll conveyor. The conveyor chain is an all steel chain of tubular form made up of seamless tubing of high carbon content, and available in different pitches to meet requirements. It is extremely flexible. For instance the 4 in. pitch chain will travel, it is said, around a 6 in. radius. The connecting links, shaped like dumbbells, are turned from solid steel stock. Each 10 ft. section is connected to the next succeeding section by a coupler link made by cutting a regular link in half and then threading the inside of each half so that a plug is screwed into each half, securely joining them. Due to the design, it is said, the line can be blocked without stopping the conveyor, the chain simply slipping beneath the load and when the block is released the load starts traveling immediately. The live roll conveyor consists of a uniform gravity conveyor to which a live roll feature is added. It is made in four types, horizontal, incline, decline and spiral.



This Atlas sheet steel handling truck combines lineal travel with vertical transportation via the inclined table.

Mathews Conveyor Co., Ellwood City, Pa., in conjunction with the **Wean Engineering Co.**, Warren, Ohio, developed a herringbone run-out conveyor for handling hot sheets between double pack furnaces and a feeder table located immediately in front of the rolling mill. The hot sheets or packs leaving the furnace are carried forward directly in line with the furnace chains by water-cooled rollers directly across the furnace doors. The purpose of these rollers is to remove the sheets far enough so that when they come into contact with the rolls set at an angle, or herringbone fashion, there is no motion of the sheet across the furnace chains. Large disks are used on these rollers to get as close to the furnace chain as possible and assure a proper receive of the sheet. Special high temperature self-aligning bearings are used. The rollers in the main herringbone section are set at an angle dependent upon the width of the furnace and the distance between the furnace and the conveyor feeding the mill. The sheet has its major axis retained parallel to the centerline of the furnace. The driving is done by means of a precision roller chain passing over the top of sprockets welded to the roller. One of these live roller conveyors is designed to accommodate a furnace used both for normalizing and annealing steel sheets. A tilted section of wheel conveyor forms a 90 deg. transfer and is used to convey normalized sheets. When the furnace is used for normalizing, a fixed stop is raised above the top of the live rollers at the end of the transfer section. As the sheet and the rider sheets emerge from the furnace they are conveyed straight ahead to a point preceding the fixed stop, where a limit switch is engaged, which in turn operates the transfer section, raising it above the live rollers, thereby causing the sheets to travel quickly in the opposite direction to a wheel conveyor station. When sheets are being annealed, the right angle transfer section is not used; the limit switch disappears below the top of the live rollers when

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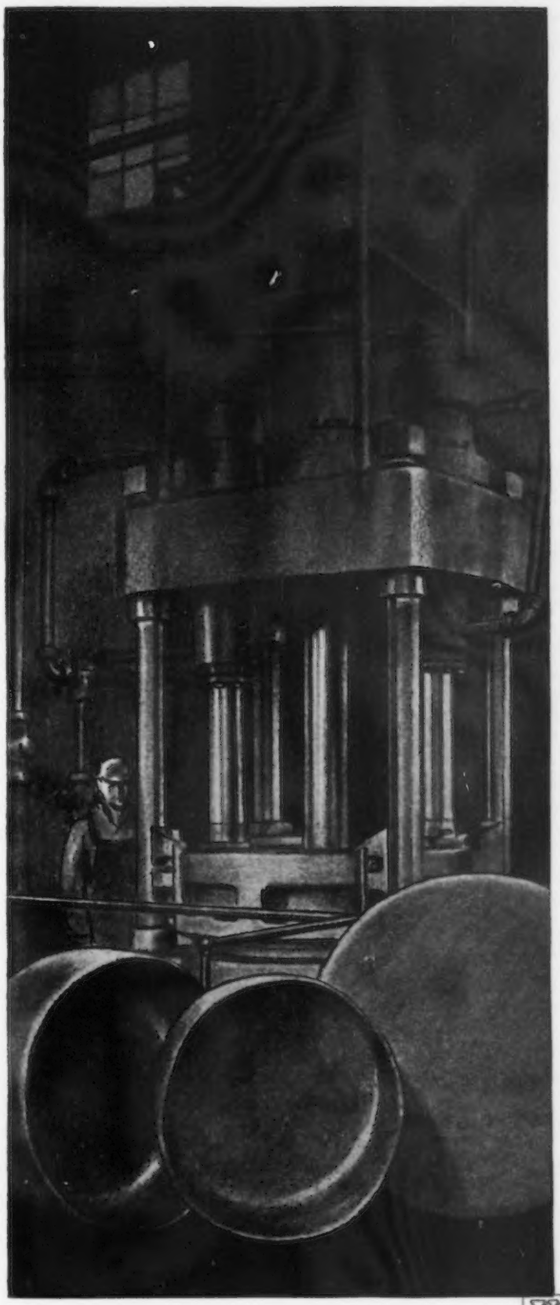
USS

PLYKROME



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(Continued from Page 112)

the roller stop is lowered, permitting annealed sheets to travel straight ahead to the roller leveller.

Among the many 1933 developments in the line of the **Link-Belt Co.**, Chicago, are a new type flat angle vibrating screen, a new automatic washing machine for beer barrels and kegs, a dewatering rotoscoop, a reciprocating sewage distributor and a conveyor for hot bottles. As an installation of unusual interest is one for handling "Spheron," a new form of carbon black. This is received at the plant of the Firestone Tire & Rubber Co., Akron, Ohio, in a "Dry-Flo" self-unloading car equipped with a Link-Belt chain conveyor. Through a flexible spout, the material is discharged to horizontal screw feeder and thence vertically along the outside wall of the five-story building to a storage tank on the roof. Shipments are received in 50,000 lb. lots which are unloaded in three to four hours. The vibrating screen is designed for closer sizing of materials, particularly free flowing materials, such as gravel, crushed stone, coal and coke and ore. The flat angle of this screen is said to make it adaptable for conditions where head room is at a premium, and it is said to have the additional advantage of reducing the height of screen supporting structure. The washing machine has a series of stations in line, for the different operations necessary, and employs transport beams for moving the different sizes of barrels from one station to the next. The beams have pairs of brackets on top to carry the barrels in the proper position. Variable speed drive is provided so that the barrels are picked up at one station and deposited at the next in approximately eight seconds, while about 12 seconds are allowed at each station for the soaking, scrubbing, cleaning or draining operation, when the machine is set for a capacity of 180 barrels per hr. At the first soaking station, sprays of water are directed on the outside of the barrel, and a combined bung finder and water pipe delivers water into the barrel. Sprays of water are also directed on the outside of the barrel at the scrubbing station, where the barrel is revolved at high speed under the pressure of self adjusting brushes, applied to the ends and top to clean off the outside dirt. The next station has a bung hole finder which stops the barrel in a draining position, after which it is delivered over two hot water nozzles and one cold water nozzle.

The Rotoscoop is said to fill a need for a sand dewatering device which would catch the available sand grains of sufficient fineness to meet specifications and deliver a product dry enough to permit truck transportation, or conveying to and from storage. It consists of a large circular steel tank, made in halves for easy installation, together with a rotating Disk carrying inclined scoops, capacities varying from 25 to 100 tons per hour. The inlet and the discharge are on approximately the same level. The unit is entirely self-contained.

The sewage treatment plant unit is known as a Link-Belt reciprocating distributer, and consists of a trough extending over the filter bed, carried on trucks at both ends. These trucks run on rails mounted on the walls of the filter. A channel runs the entire length of the filter bed, and the sewage is syphoned from it to the trough of the distributer. The sewage is distributed by means of "V" notch slots in the trough. Under each notch is a spreader plate welded to the trough. From the spreader plate the sewage drops on to an angle which distributes the flow over a uniform area. An overhead trolley system transmits power to the motor.

The new hot bottle conveyor employs a grating-type of tray made of copper and connected to, and supported on, or from the inner sides of two strands of finished steel roller chain. The standard width of the tray is 4¼ in.

Robins Conveying Belt Co., New York, has announced what the com-

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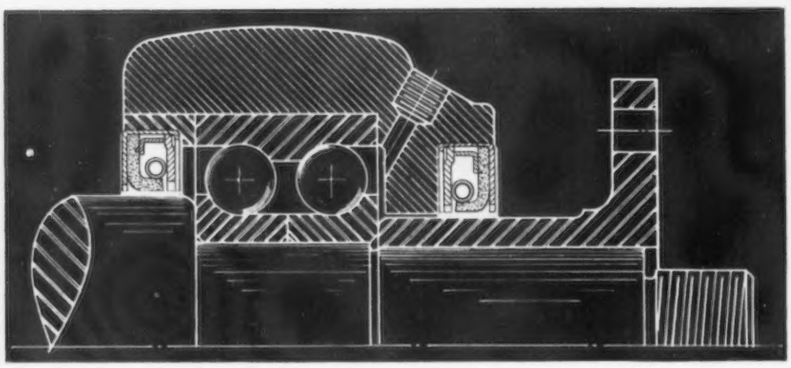
PROTECT YOUR BEARINGS



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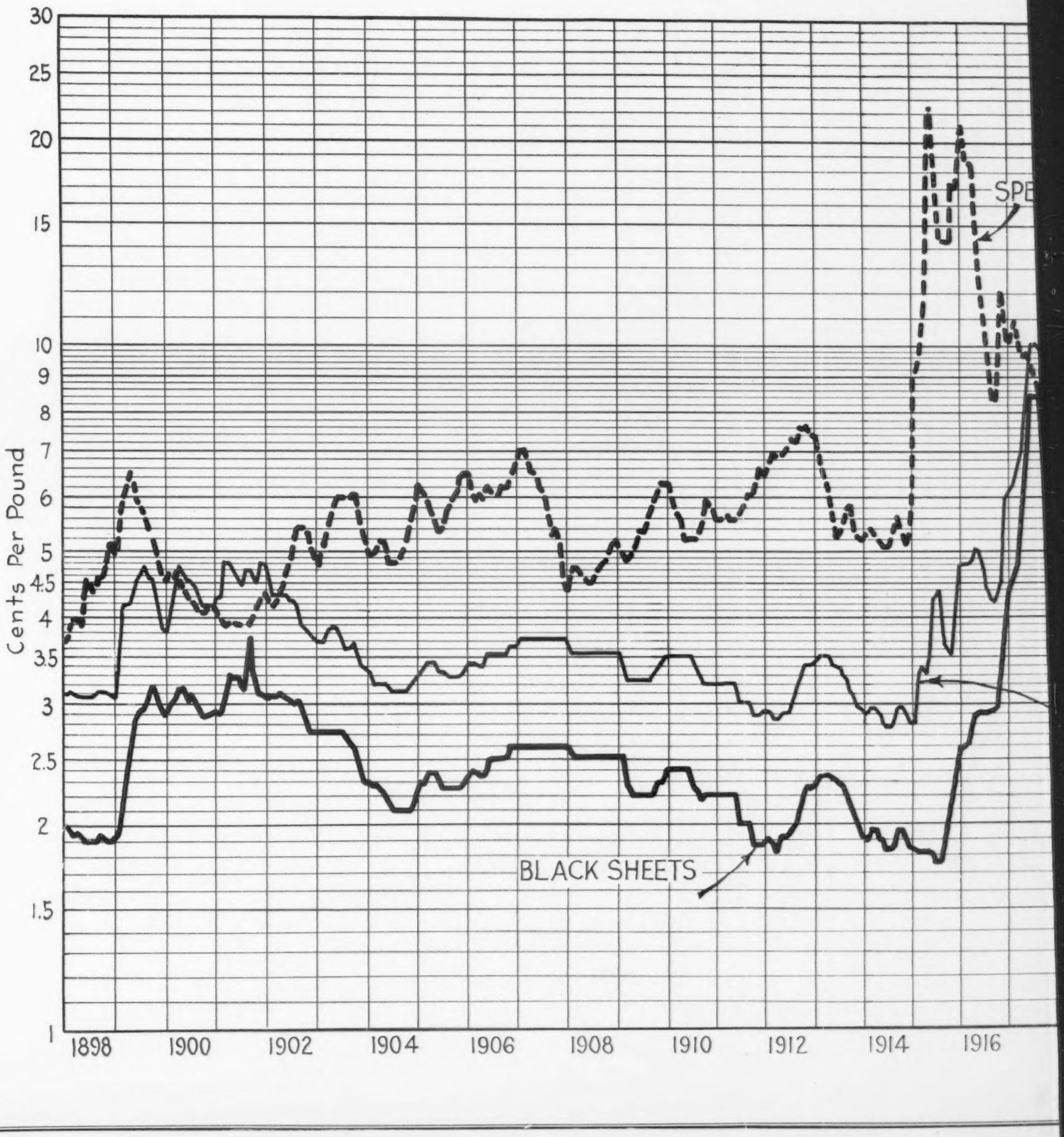
2. Operating life equal to that of the machine on which it is installed.
3. Less expensive than other seals not so effective.
4. Excludes all moisture and dust, protecting bearing lubricant against oxidation and emulsification.
5. Much easier to install than other seals . . . comes fully assembled ready to press into position.
6. Automatic adjustment . . . needs no supervision.
7. Tough leather packing member is impervious to all mineral oils.

THE CHICAGO RAWHIDE MANUFACTURING CO.
1306 ELSTON AVENUE, CHICAGO, ILL.
NEW YORK DETROIT CLEVELAND PHILADELPHIA PITTSBURGH

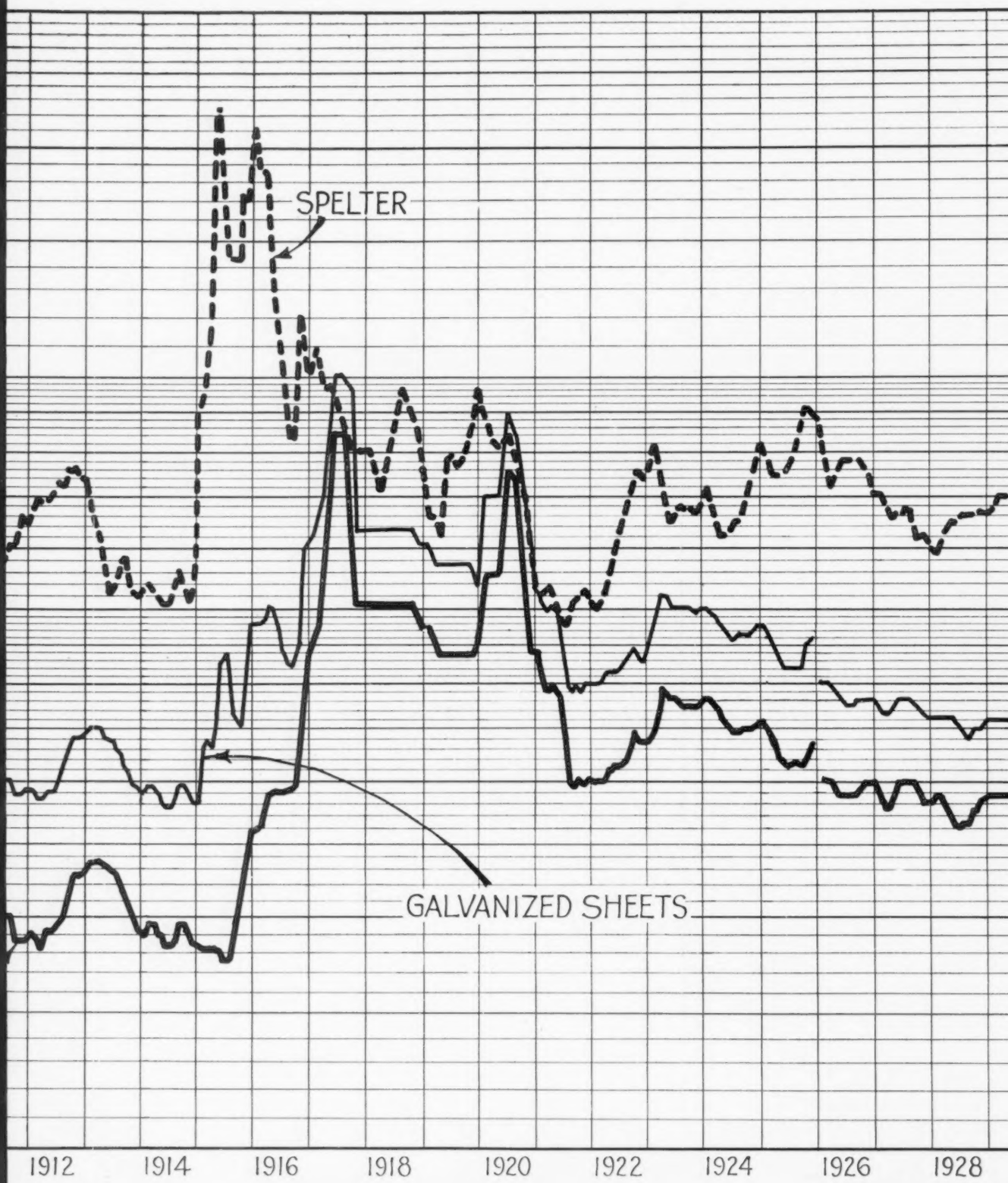
MONTHLY PRICES OF BLACK AND GALVANIZED SHEETS,

(On No. 24 gage sheets since 1926



VANIZED SHEETS, AT PITTSBURGH, AND SPELTER, A

24 gage sheets since 1926 and No. 28 theretofore)



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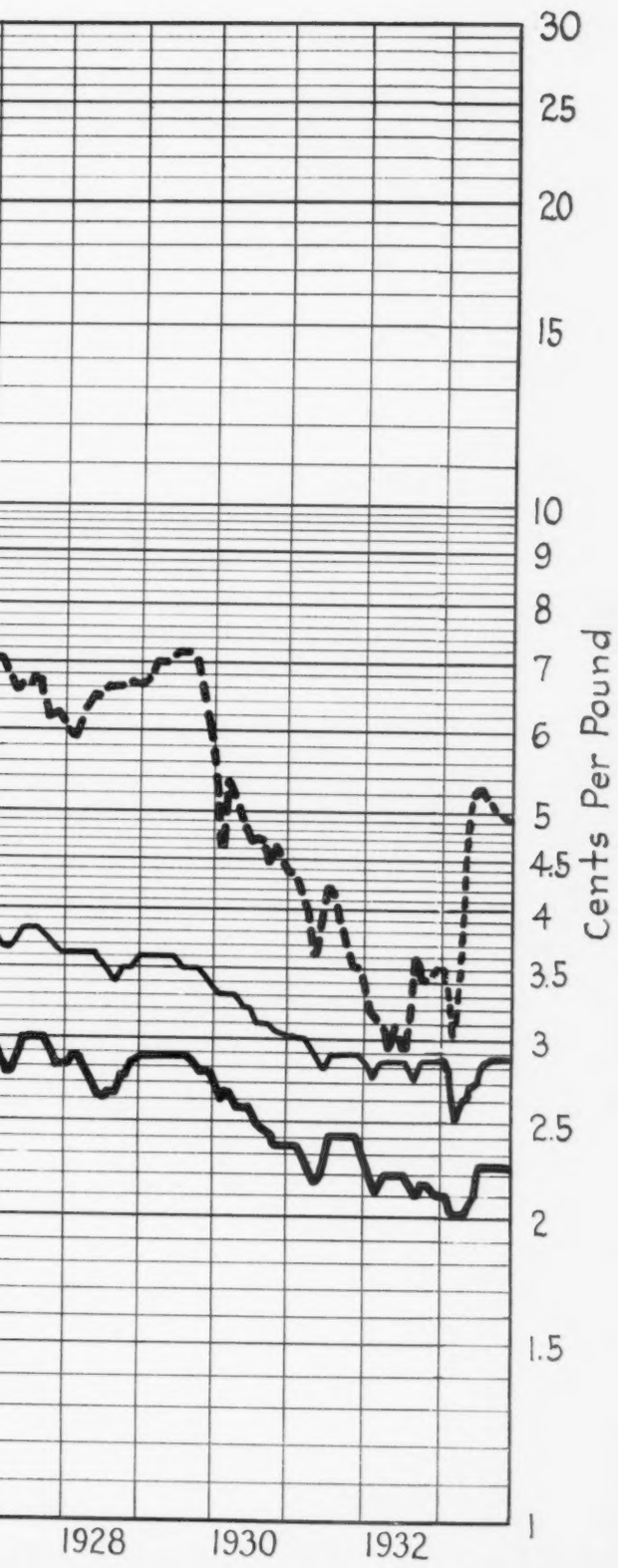

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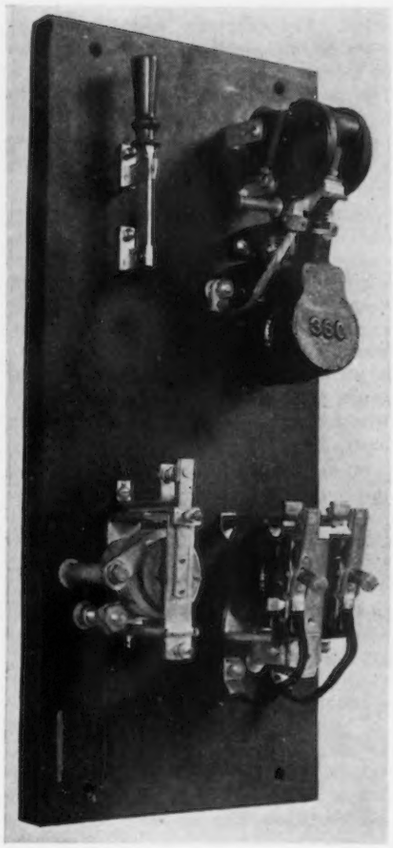


New type of high-speed lowering relay, produced by Harnischfeger Corpn. for automatic control of no load and light load speeds.

(Continued from Page 114)

pany calls a "Super Manga Iron," a nickel-chromium cast iron which, it is claimed, is especially suited to the following applications: Gates, mill balls, grizzly bars, wharf plates, chutes and liners, crusher rolls, pump castings, etc. The chilled surface of the iron, it is said, will show a Brinell hardness of 600-750. Wear tests, it is claimed, indicate 2 to 12 times longer life than plain chilled iron in numerous applications.

One of the outstanding developments in the monorail field during the past year is a new air wheel tractor trolley, placed on the market by **American MonoRail Co.**, Cleveland. The units can be furnished for operation with any type of overhead rail having a smooth under-surface and can be provided for any current characteristic and for a wide range of controls. The new feature is an air or live rubber wheel to drive on the bottom of the overhead track. Structurally it is simple, traction being secured by pressure contact of the rubber wheel against the bottom of the rail, giving a powerful drawbar pull. Where materials are to be handled over long hauls, the unit can be sent on its way alone with limit stop switches arranged to stop the unit at any desired point. Reverse controls sends it on its return journey. A ¾-hp. motor will move a train of trolleys or racks carrying a combined load of five to 10 tons along horizontal rail runways.

Among the **Cleveland Tramrail Co.'s** contributions of the year are new bale handling grabs, a new motor driven carrier for floor controlled units, a new line of lighter weight cranes and transfer bridges, an eight-in. arch beam and new all welded sliding type switch. The new grabs are designed for handling bales which can be pierced without damage. The grab consists of suitably arranged screws, which are rotated by a motor and gear mechanism and which penetrate the material a sufficient depth to lift the load. The grab may be used for handling cotton, waste paper, pulp, straw, bagasse or any product in baled form, or for wood crates, barrels and boxes where piercing of the top of the container is permissible. The motor driven carrier is obtainable with electric hoists of 500, 1000 and 2000 lb. capacity. It incorporates spring backed guide rollers to prevent flange wear on curves, compression type king pins supported top and bottom and a load bar of weld-steel with shock absorbing rocker springs to provide floating suspension of the hoist. The new cranes and transfer bridges are for loads up to one ton where the bridge span is not over 16 ft. Electrical fittings can be added at any time to change the system from one using chain hoists to a motor operated hoist.

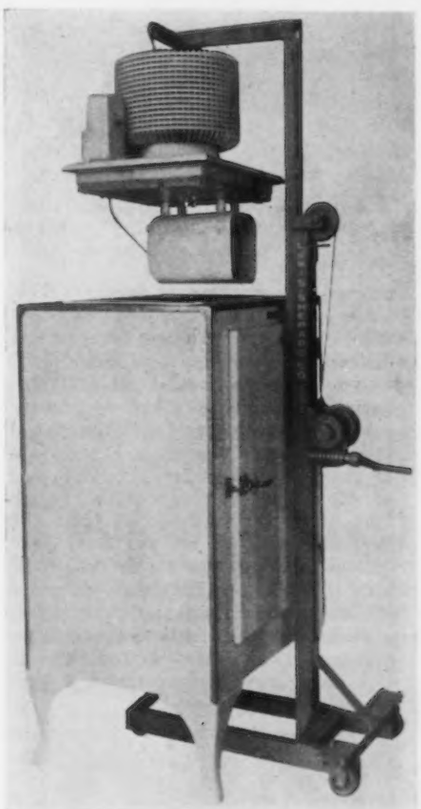
The new eight-inch arch beam is designed to fill the need for self-supporting rail for loads up to and including two tons under proper loading conditions. The new switch is suitable for all types of Cleveland hand propelled carriers and for floor controlled electrically propelled carriers. It is built entirely of rolled steel members rigidly welded together, with a rigid outer frame and a sliding inner member. It is designed to fill the need for a switch intermediate between the standard sliding type and the tongue type switches.

Chisholm-Moore Hoist Corpn., Tonawanda, N. Y., has brought out a new high speed, spur geared safety hoist. A feature is a patented safety overload governor which warns against dangerous, excessive overloads. The hoist has a simplified adjustable load brake. On smaller capacities a quick lowering device is optional. Grease bath provides positive lubrication in a dust-proof, oil-tight housing. Steel and malleable iron are used. Capacities range from ¼ to 40 tons, inclusive.

Wright Mfg. Division of **American Chain Co., Bridgeport,** Conn., has introduced a new chain hoist. In raising the load, both sheaves operate on heavy duty ball bearings. The roller bearing lower swivel hook prevents the lower sheave from twisting so that the chain always rides squarely in the load wheel pockets, which are precision formed. A ratchet is provided to prevent the load from lowering too rapidly. This ratchet allows the upper load sheave to operate on ball bearings when raising the load, and on plain bearings when lowering the load.

Euclid-Armington Corpn., Euclid, Ohio, has introduced a new model 1-ton electric hoist with motor driven trolley. In the design of this new line electrically welded roller steel sections are used instead of castings. Rolled steel plates are welded into a box-like structure, which is not only considerably lighter than a casting, but is said to be many times stronger and safer. The cast iron gear box in this type serves only to provide an oil tight housing for the gear reduction, the entire load being borne by the rolled steel plates comprising the main frame. The same design is used in the driving trolley, which is similarly made of heavy steel plate. The gears in the driving trolley are entirely enclosed in an oil tight grey iron housing, but this does not support any of the load. The hoists are made in sizes ranging from ½ ton to 10 tons capacity.

Yale & Towne Mfg. Co., Philadelphia, has introduced a new ball bearing steel safety hook for use on all Yale spur geared hand chain hoists and Yale electric hoists up to three tons capacity. A new 3-ton trolley



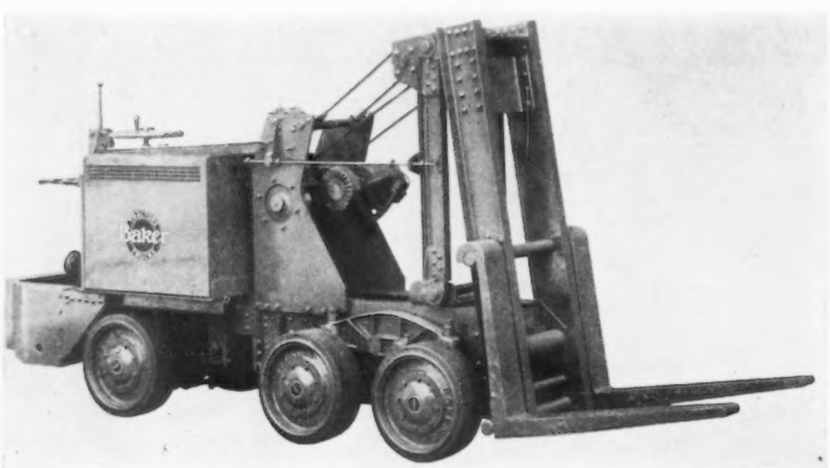
For convenience in refrigerator assembly, the Lewis-Shepard Co. has originated this simple but effective type of hand lift.

type, manual control, electric hoist has also made its appearance during the year in this company's line. Another new item is a new steel trolley, made in two models. Totally enclosed ball bearings, patented detachable shackles, heavy steel drop forged load hooks, crossheads and shackles are features of the new hook, which is manufactured in capacities from ¼ ton to 3 tons for single chain high speed hoists.

Harnischfeger Corpn., Milwaukee, has announced that its chief electrical engineer, W. Oesterlein, has designed a new type high speed lowering relay, which can be applied to any d.c. motor operated crane equipped with series motors and dynamic lowering control. It is available for any size of hoist motors from 110 to 550 volts. It is automatic in operation, and increases the operating speed of the hoist drive. It consists of an ebony-asbestos panel on which are mounted on top a single pole, single-throw knife switch and a spring-closed contactor, on the bottom a normally opened current relay and a standard two-pole control circuit relay. Additional equipment required consists of a bank of wire or grid resistance, and two additional fingers and segments in the hoist controller. The function of the relay is to increase the no load and light load speeds from 150 per cent speed to 200 per cent speed on the last control step. When the load is heavier than about one third of the normal capacity, this relay automatically prevents the speed increase and the controller functions as if it were not equipped with a high speed lowering relay.

Faultless Caster Co., Evansville, Ind., added to its line during the year a new series truck caster and new stretcher carrier casters. The new truck caster is a 3-in. unit. The top plate is formed of one piece of steel, corrugated for additional strength and forming an apron for the ball race, providing a dust-proof construction. The top plate is hardened. A hardened, pressed steel ball race completely covers the upper row of balls, and with a corrugated plate forms a grease chamber. A lower row of balls takes up the thrust and rolls on a turned, hardened spacer. The entire swivel head is accurately fitted in an assembly which is maintained by a steel spacer and king-pin construction tapered at both ends. The new stretcher carrier caster is designed as a medium heavy duty unit. The swivel is a Timken tapered bearing with a row of ball bearings. The caster is available in rigid, as well as in swivel construction.

Service Caster & Truck Co., Albion, Mich., has announced a Forge-Weld caster and a Textolite wheel during the past year. The top plate and yoke base of the former are of drop forged steel. The legs of the yoke are cut from structural steel. The caster is assembled by arc-welding. It has double ball bearing swivel, Hyatt roller bearing axle and high pressure lubrication at two points. The new wheels are made of Textolite, a General Electric Co. product.



A Baker heavy-duty charging truck. Designed with plenty of stamina for annealing furnace and mill operation.

Thew Shovel Co., Lorain, Ohio, has announced a new design in the field of excavating equipment, a ⅜ to ¾ cu. yd. machine, which features elimination of excess weight. By tilting the machinery frame to the rear of the machine, it is made to perform double duty, using its own weight for counterbalancing. The machines have a number of other special features, including a new design of tubular dipper stick. Another development of this company is the application of the Caterpillar Diesel engine to its 1½-cu. yd. machine.

Godfrey Conveyor Co., Elkhart, Ind., has developed a self-propelled portable conveyor with a platform on the side where the operator rides and steers the machine while moving it from one place to another. Three simple levers control the entire operation. The carriage will travel forward or backward, and the trough can be raised or lowered at the same time. The machines are made in any length from 20 to 60 ft. The boot is equipped with a skid plate for plowing into piles. A separate clutch controls each wheel.

Among the many novel installations of the past year is one in which nine specially designed **Robbins & Myers** electric hoists, controlled from the deck of the barges, are utilized to raise and lower the telescoping unloading pipes used in connection with a pneumatic system for handling of grain from barges. This installation was made at the Port of Albany, Albany, N. Y.

Another installation with important improvements is an electrically operated floating wrecking crane which was furnished by **Industrial Brownhoist Corpn.** for the Panama Canal. This large crane was erected on a floating barge and has a capacity of 150,000 lb. at 30 ft. radius with an auxiliary hoist of 40,000 lb. at 35 ft. radius. The hoisting unit consists of a main hoist which operates full load of 150,000 lb. at 12 ft. per min. and an auxiliary hoist which operates 40,000 lb. at 30 ft. per min. Each hoisting unit was powered by an independent motor. The slewing mechanism is capable of rotating the crane with full load on the hook at a 30 ft. radius at an angle of eight deg. list of ship. This mechanism is also driven by an independent motor. The crane is mounted on equalizing rollers, front and rear, revolving on an 18-ft. diameter steel casting conical roller path. The crane is equipped with pick-up rollers in the rear and pick-up hook in front to prevent it from overturning in either direction.

An installation of materials handling equipment of interest to sanitary engineers is that made by **Richards-Wilcox Mfg. Co.** at the new sewage disposal plant at Geneva, Ill. In the sludge bed building two parallel runs of Steelbeam track have been erected. On each one there is a bottom tipping bucket controlled by chain hoist. The two tracks extend out beyond the building about 12 ft. and the dumping buckets are pushed outside and dumped directly into trucks.

Other developments during the year included new types of motor trucks for beer handling, with drop frame chassis and gravity plan bodies with roller conveyors and tier racks; new light-weight elevating lift trucks (**Lancaster Iron Works**, Lancaster, Pa.), a new gas-electric truck power unit for replacing storage batteries in electrical industrial trucks (**Syntron Co.**, Pittsburgh), a portable bag stacker for any bagged material (**Jeffrey Mfg. Co.**, Columbus) operating at a maximum angle of 45 deg., a maximum discharge of 18 ft. and minimum discharge of 8 ft., useful for either piling or unpiling.

Machine Tools Developed to Meet Lower-Cost Production

By R. E. MILLER
Machinery Editor, THE IRON AGE

NEW or improved machine tools introduced during 1933 have carried the notable progress of the past few years to new high levels. They offer increased quantity or quality of output, or both, and many of the new designs feature ready adaptability for small lot production as well as long runs, and also greater flexibility to meet changes in product design or materials.

Heavier construction, greater compactness, use of better materials, more convenient operation, wide speed and feed ranges, and built-in electric motors and controls are general trends. Extensive use of anti-friction bearings and fully-automatic lubrication, in many cases with filtered oil, features most designs. Application of hydraulic operation and control has increased.

Modern shop equipment well anticipates the requirements of "prosperity" production volumes; in the meantime, for industries operating under NRA codes, the modern designs offer the means of lowering costs to counteract the wage increases brought about by the shortened labor hours. The latter advantage was emphasized recently by Ralph E. Flanders, president, Jones & Lamson Machine Co., and a member of the NRA advisory board, in a recent statement relating to equipment policies under the codes.

"The first and illogical practice in working under a code has been to view the decreased labor hours and the increased labor cost as simple additional expenses, and to avoid every 'unnecessary' expense in consequence," he said. "The short-sighted view has been to class improvement in equipment in the 'unnecessary' category and to run every old wreck in the plant, with whatever help can be hired to run it, in an endeavor to counteract the shorter hours. Experience soon indicates that the inefficiency of the old machines is added to the increased wage rates and thus raises cost far beyond the point where prices can safely be set to produce a profit."

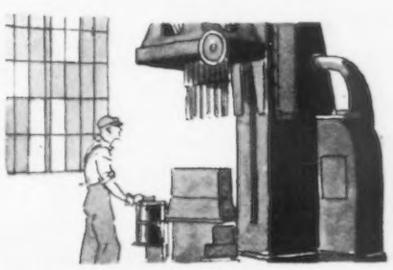
A policy of replacing obsolete equipment with the best of the new designs will, if wisely applied, maintain profits in spite of increased wages and shorter hours, states Mr. Flanders.

Although perhaps not as many new machines were introduced this year as last, there have been substantial developments in all classes of machine tools. Most numerous were grinders. Wider application of surface or external broaching has also been a feature of the year.

Grinding Machines Highly Developed

THE new or improved grinding machines embraced all types; and two interesting new sizing devices, one electrical and one air, were announced. Hydraulic operation continues an outstanding feature, and automatic lubrication, which in at least one case includes forced feed lubrication of the table and wheel-slide ways, is provided. V-belt motor drives predominate. Power and massiveness are especially impressive in some of the new designs; also simplicity of control—in some cases by means of a single lever.

The high status of grinding machine development was emphasized also in the recent annual report of the machine shop practice division of the American Society of Mechanical Engineers. Radical changes in design of automobile components, such as camshafts and crankshafts, have led to the development of precision grinding machines of a size, power and range hitherto considered impractical, states the report. While the principle of operation is unchanged, there is new boldness of attack in the attempt to completely machine at one chucking and one tooling parts that formerly required several chuckings and several tool applications, it is stated.



Three such highly developed machines for the automotive industry, two cam grinders and a crankpin grinder, were included in a recent demonstration of 20 or more new machines at the plant of a prominent manufacturer of grinding machines and abrasives. Every type of grinder built by that company has in the last few years either been redesigned or replaced by a new design.

Cam Contours Ground Automatically

One cam grinder automatically grinds each cam contour and eccentric on a camshaft with striking precision and trues the grinding wheel without any attention from the operator. The 36-in. machine of this design weighs about 16,600 lb. The other cam grinder is a large, powerful machine for grinding simultaneously all the cam contours on an automotive camshaft. Its three major parts are a wheel truing mechanism, grinding wheel unit with a wheel for each cam on the shaft, and a work-supporting and driving unit. The truing mechanism comprises a set of master cams, one for each cam on the shaft, and a corresponding set of diamonds actuated by the masters.

The crankpin grinder is a hydraulically-operated machine of double-head type. One head is fixed longitudinally but has lateral adjustment,

and the other is fixed laterally but has longitudinal adjustment, an arrangement that gives flexibility and simplifies retooling when changing models. An interlock prevents opening of work holders while the work is rotating; nor can the table be moved by power when the work is rotating, the wheel side is advanced or the steady-rest in position. The wheel unit weighs more than 3300 lb., and the spindle alone, 130 lb.

Cylindrical Grinders Designed for Flexibility

Flexibility is a feature of a new line of 10 and 16-in. high-production, precision cylindrical grinders brought out by the same company. These machines are available with hydraulic, mechanical or hand traverse; also as semi-automatic or full automatic grinders, and with semi-automatic and hydraulic traverse arrangment in the same machine. Practically any model in this new line can be converted at any time into any other of the same swing. The wheel slide has a slide-mounted motor with end drive to the spindle directly by V-belts. With motor it weighs more than a ton. Spindle bearings are flood lubri-

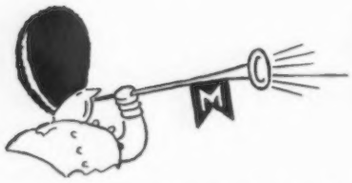
cated, and table and wheel-slide ways, which are unusually long, are force feed lubricated.

A new automatic electric sizing device which stops the grinding wheel feed, provides for a dwell period, and reverses the wheel-feed directly from the work diameter, was also demonstrated by the company. Advantages claimed include virtual elimination of inspection operations, as the work can be ground accurately round and within a limit of 0.0003 in. Compensation for wheel wear is not necessary, and grinding wheels can be trued or replaced without disturbing the set-up.

Universal Grinder for Manufacturing Uses

A 14-in. universal grinder designed to provide manufacturing possibilities, as well as the flexibility of a universal machine, was developed by another builder. Heavy construction is a feature. The hydraulic table feeds in connection with the multi-speed headstock permit selection of work and table speeds best suited for the work. A wide range of equipment has been designed for the machine. Ease of operation and high degree of flexibility are provided in a 10-in. plain hydraulic grinder built by the same company. The wheel base or headstock can be set at an angle, and crank heads can be furnished. Operation can be full or semi-automatic. Straight infeed grinding can be done and also formed wheel and multiple-wheel grinding. Automatic hydraulic wheel feed can be supplied.

The same company developed an air sizing device for its hydraulic grinders. It is simple and fully automatic and can be used for both external and internal grinding operations. Work is said to be sized within limits of 0.00025 in. Operation is based on the principle that if air is escaping from a pressure line, the pressure is affected by the size and shape of the outlet through which it is escaping. This change of pressure is used to



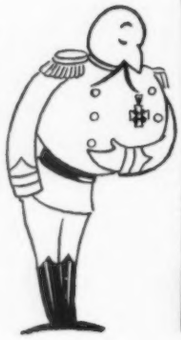
MORSE PRESENTS

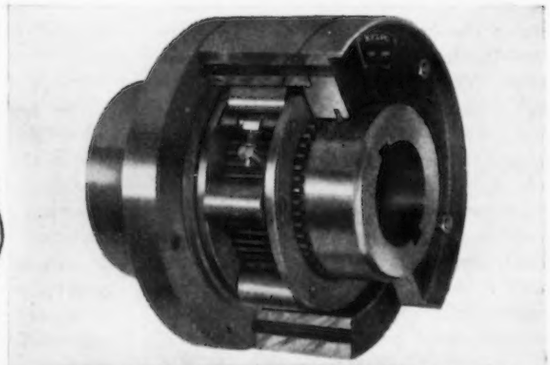
A POSITIVE-ACTION free-wheeling clutch for industrial installations, simple in design and construction. Nickel alloy steels hardened and ground to close limits insure long life and constant service.

Suitable for high speeds, the Kelpo runs cool, is perfectly balanced, and is not affected by centrifugal force. It is the only free-wheeling clutch which compensates for wear.

Kelpo Clutches can be used wherever wheels turn—many special machine applications. Interlocking between two power sources is unnecessary when the Kelpo Clutch is used.

Kelpo Clutches are now manufactured by the Morse Chain Co.—your assurance of quality and proper engineering application. Write for more information.





MORSE-KELPO FREE WHEELING CLUTCH

MORSE

ITHACA, NEW YORK

Manufacturers of Morse Silent Chains · Roller Chains · Standard Couplings · Flexible Couplings · Pullmore Clutches

change the level of the mercury in a U-tube to close contacts that complete electric circuits that energize solenoids that control feeds and other machine movements.

Roll Grinders Feature Accurate Crowning and Concaving

In roll grinders a 60-in. x 20-ft. machine for heavy roughing and light finishing cuts on strip and sheet mill rolls, including the backing rolls of four-high mills, was brought out. This machine, one of the largest of its type, weighs 177,125 lb. It incorporates new features designed to eliminate vibration and increase accuracy of crowning and concaving.

A hydraulically-operated attachment for producing uniform crowns or concave faces on rolls has been developed by another company for its double-table machine. Relatively coarse adjustments of the form bar are said to produce very fine results in the roll face. The device includes a table type diamond tool-holder that can be mounted without removing the roll. When in position the diamond is directly in line with the pivot point of the table, and consequently a concave or convex wheel face is produced

which corresponds to the crown or concavity of the roll face.

Improved Internal Grinders

Internal grinders announced during 1933 included a heavy-duty 21- or 31-in. swing, single-slide control machine for long and large bores. Unusual production and new high standards of finish are claimed. The bed casting alone weighs more than 6000 lb. Diamond holder, cross-feed and wheel lifter, as well as the wheel-slide are hydraulically operated. The various units are interlocked and complete control of all movements is had by means of a single lever.

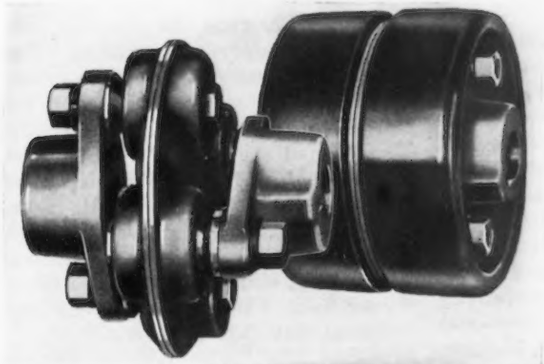
A prominent internal grinder for small work has improvements that assure better finish, consistent accuracy, and higher production. Hydraulic control for the cross-slide permits selection of exactly the right table and wheel feeds, independently of each other. This control gives four feed adjustments. Individual drive for the workhead facilitates positioning this unit for angular work. An automatic hydraulically-operated clutch starts and stops the spindle. The fixture mechanism is also hydraulically operated.

The same company has furnished an internal grinder arranged with two wheels on the one wheel spindle—one wheel for rough and the other for finish grinding or one wheel for both rough and finish grinding and the other for polishing. Operating sequence is automatic, including wheel truing and work sizing. In addition to higher production, maximum accuracy is said to be obtained because of completely finishing the hole at one chucking.

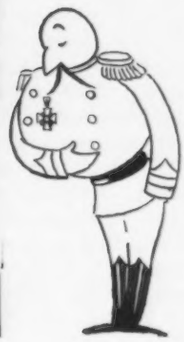
An automatic vertical internal grinder, six stations of which are for grinding and two for reloading or one for reloading and the other for polishing or gaging, was brought out. The machine can be arranged for double indexing. Grinding wheels can

MORSE PRESENTS

A Companion to the Standard Chain Coupling



THE MORFLEX COUPLING



THIS new Morse Flexible Coupling, a fitting companion to the Morse Standard Coupling, is both simple in design and rugged in construction. It is noiseless in operation, and utilizes a new, especially developed rubber as the flexing medium.

Accurate tests of the Morflex Coupling demonstrate a maximum of flexibility without power loss. Shocks and uneven impulses are absorbed, and sudden reversal can take place without damage.

The Morflex Coupling needs no lubrication. It needs no protection from atmospheric conditions—water, oil, dirt or grit do not interfere with its smooth operation.

Made by Morse Chain Co., which means quality and precision products. Write for further information.

CHAIN CO.

DETROIT, MICHIGAN

Morse Chain Co., Limited, Letchworth, Herts, England · Branches in Principal Cities · Division of Borg-Warner Corporation

be of different sizes, and each wheel is dressed automatically independently of the others. Speed and feed of each wheel are also independent. Roughing and finishing wheels may be used.

Surface Grinders Combine Precision and Operating Conveniences

In surface grinders, four or more machines that combine high precision with convenience of operation were made available.

One of them is a hand feed precision tool room unit having an inbuilt direct motor-driven ball-bearing spindle. Speeds up to 18,000 r.p.m. are available. Table traverse is by a roller chain and sprocket arrangement that is said not only to assure smooth table travel but to eliminate backlash and marks on the work. Another machine is a 6 x 18-in. hydraulically-operated unit with either hand or automatic cross feed. The spindle is of cartridge type with plain or ball bearings, but an integral motor and spindle type is available. Table ways are force feed lubricated and the saddle ways are flood lubricated.

A line of fully hydraulic surface grinders was also introduced. Traversing speed of both table and wheel head can be easily varied, and all functions are controlled from a central valve panel. A vertical-spindle surface grinder with hydraulic table speeds ranging from 2 ft. to more than 100 ft. per min. developed by another builder. For moving the wheel head with its motor and spindle assembly, a heavy unit, a motor-driven rapid traverse mechanism is supplied.

Other grinders included two contour, two worm and several tool and cutter grinders. One contour grinder has a vertical, reciprocating wheel spindle said to assure better cutting action and to prevent forming shoulders on the wheel. It grinds both internal and external irregular shapes. The table is "in the clear" and can be tilted for angular grinding. A radius attachment permits grinding convex radii on the end of rectangular and square stock.

A highly-developed grinding machine that reproduces profiles directly from a drawing is being offered for grinding form tools, templet gages and a wide variety of other irregular-contour parts. The machine employs a 50 to 1 pantograph arrangement and an optical attachment. It can also be used for drawing and examining given profiles. An attachment permits grinding round form tools.

Tool and Cutter and Chaser Grinders

Of several tool grinders, one, a small universal tool and cutter grinder weighing 850 lb., features unusually convenient operation. The base is such that it may be straddled by the operator, and handwheels and levers can be transferred to corresponding positions at the opposite side or the rear. The spindle is of cartridge type with plain, ball or double taper bearings and is driven by V-belts from a motor on the wheel-head.

A tool grinder with three spindles, all of which are reversible, features three speed combinations for grinding high-speed steel and stellite or cemented carbide tools. The third spindle in all combinations is equipped with a cast-iron disk for honing. Two other machines for grinding or lapping carbide tools were also offered, as well as new lapping wheels and hand laps for producing a fine finish on such tools.

Die head or tap chasers of all types are sharpened conveniently on a new chaser grinder equipped with a special universal fixture. Chasers may be swung under the grinding wheel for chamfer and face grinding.

Surface Broaching More Widely Applied

NEW equipment for external or surface broaching included a horizontal, continuous machine with a chain-type conveyor that carries the work-holding fixtures through a tunnel equipped with a broach holder and broach. The operator drops the work into the fixtures as they come to the loading position, the work being located and clamped automatically. After the fixtures pass through the broach cut they are released automatically, and the work falls into a chute at the unloading end of the machine. This type of machine lends itself to unusually long broaches with many teeth, thus making possible almost any desired quality of finish.

As has been stated, interest in external or surface broaching has heightened considerably. Application of the process is characterized in the annual progress report of the A.S.M.E. machine shop practice division as probably the most outstanding development of the year, in some applications showing remarkably attractive results. The rapid progress in the application of this comparatively new art—also its bright future—was likewise emphasized by C. E. Bleicher, Chrysler Corpn., in a highly instructive address on the subject at the Automotive Engineering Congress in Chicago last September. "In the near future surface broaching will in all probability be used for machining flat surfaces of cylinder blocks and heads and like operations on large parts where the part is held stationary," he said. "Surface broaching will also be used for machining round surfaces of cam or crankshafts or like work, by passing the broach over the work as it slowly revolves through one or more revolutions."

Rough and Finish at One Stroke

In external or surface broaching metal is removed by a long broach with evenly spaced teeth, each tooth being higher than the preceding one by a predetermined amount. The broach is fastened securely in a holder and is moved over the surface of the work, or the work moved over the surface of the broach. The process may be used for finishing irregular surfaces, such as gear teeth, slots, keys, etc., and regular surfaces, such as flat pads or joints. External broaching, therefore, enters a field of operations which is practically unlimited, said Mr. Bleicher.

One of the big savings in surface broaching will come from the fact that it is possible to rough and finish with one stroke of the machine. Accuracy obtained by surface broaching is practically unlimited, he said. Lower direct labor costs and longer tool life were cited as advantages of surface broaching.

Examples of Modern Broaching Accomplishment

The following applications, selected from data supplied by two prominent

makers of surface broaching machines, show something of what has been accomplished.

In rough broaching the teeth of a forged steel steering sector shaft on a duplex surface broaching machine production is about 600 pieces an hour. The one milling machine and operator formerly employed produced about 100 pieces an hour. About 0.410 in. of stock is removed. The cutting speed is 33 ft. per min.

Wings and wing shafts for a rotary vane type shock absorber are broached from the rough at a rate of 550 to 600 pieces an hour. This is a molybdenum steel forging, and about 0.060 in. of stock is removed on a side to a tolerance of 0.0005 in. Tool life is from 25,000 to 30,000 pieces.

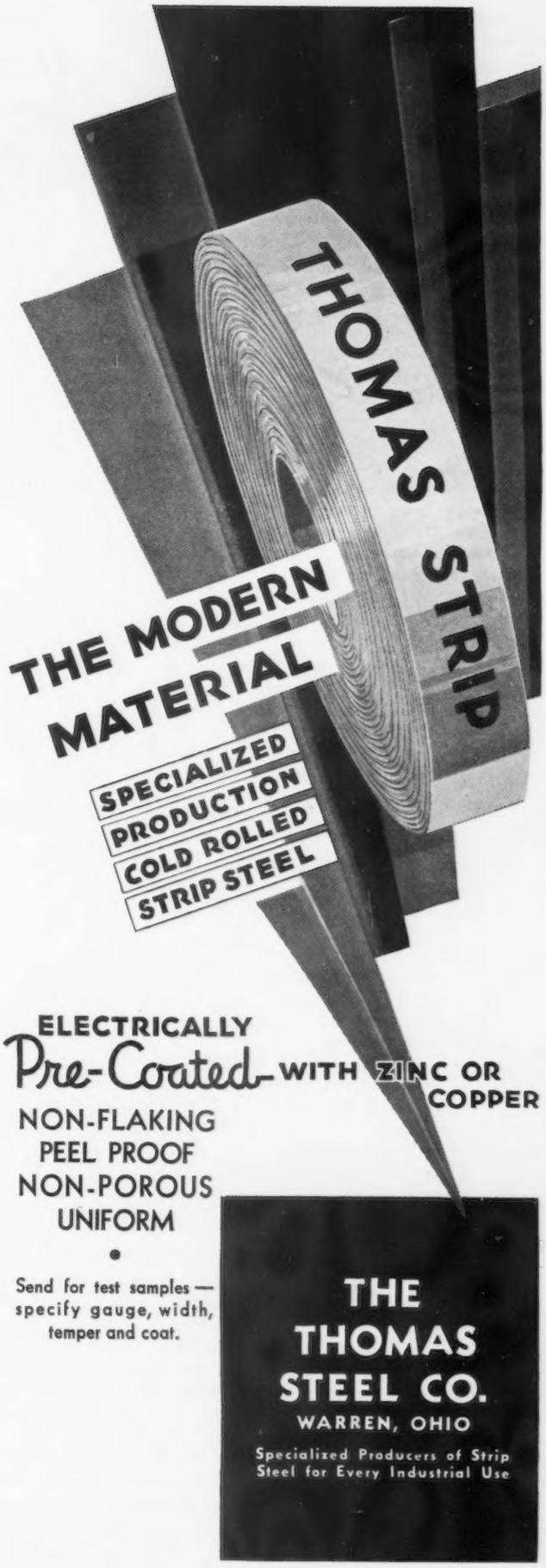
On half-rings for roller bearing universal joints two opposite radii on each of the four rings are broached complete in one pass. Stock of 1/16 in. is removed, and a tolerance of 0.0005 in. is maintained. The pieces are clamped and ejected automatically. Production is 600 pieces an hour, four radii in each piece. Tool life is from 25,000 to 30,000 pieces per grind.

In broaching the contact radii of automobile clutch throwout fingers, two radii on each of eight pieces are broached from the rough in one pass. About 1/16-in. stock is removed. The pieces are clamped and ejected automatically. From 1600 to 1800 pieces an hour are obtained. It is stated that one broaching machine and one operator will yield about the same production formerly obtained from eight millers and four operators.

In finish broaching cylinder block crankshaft bearing pads the slots for the line bearing caps are finished to plus or minus 0.0005 in., removing 0.032 in. on three sides of the previously rough machined surfaces. Production of 75 to 80 pieces an hour is obtained. It is stated that the milling equipment formerly employed yielded 11 to 13 blocks per hour per machine, with limits of plus or minus 0.001 in. High-speed steel broaching tools produce from 4500 to 5000 pieces per grind, with a life of about 50 grinds per tool. The broaching machine is a standard unit.

Lathe Developments Include Flexible Automatics

IN lathes, automatics predominated in the year's developments, with flexibility an outstanding feature. Other types included an 11-in. high-speed motor-head lathe designed to use cemented carbide tools to their



utmost. Construction is rugged, to withstand the strains of frequent starting and stopping at high speeds. The spindle can be brought up to 3600 r.p.m. and stopped five times a minute. The same company introduced an elliptical turning lathe for turning punches and mandrels or for boring elliptical holes. The form of the ellipse is determined by the contour of a master cam.

Parts of oval, triangular, square, hexagonal and other shapes with any number of sides up to 16 can be turned, bored and faced on lathes equipped with a "centrode device" introduced by another lathe builder. The sides of the parts machined may be either flat, concave or convex. If the work is irregular in contour and other than round, an automatic form-turning machine may be used in combination with the centrode device. The addition of an oval chuck will permit machining of many elongated shapes. Applied to standard lathes the chuck will produce oval work of straight contour; when used on a form-turning machine it will produce irregular-contour, oval shaped work.

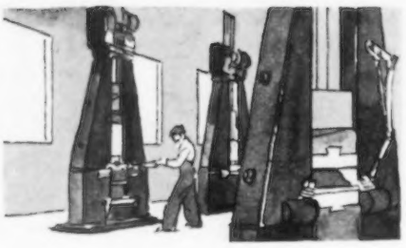
Vertical Automatic with 12 Spindles

New automatic lathes included an 8-in. model of a prominent design. The machine is for small work and for light finishing operations on large work, such as automobile transmission shafts, and has the same wide range of tooling possibilities as the larger full-automatics in this line.

A six-station automatic vertical lathe having two spindles at each station, or 12 spindles in all, was also made available for the smaller classes of work. At every index two spindles are presented at each column face, where duplicate tooling permits identical operations in each of the twin chucks. Double indexing can be provided. Boring, turning, facing, drilling and reaming can be performed on work up to 7 in. in diameter. High and low-speed ranges can be furnished, and a variety of standard tool heads can be supplied. Construction is heavy, and alloy steels and alloy castings are used extensively.

New Automatic Single-Spindle Vertical Lathes

The same company developed a line of single-spindle automatic vertical lathes, for which a trade name denoting flexibility, automaticity and mobility has been adopted. The machines are designed to be equally effective on quantity production jobs and for conditions involving frequent change of tool set-up, such as made necessary by change in work design



or by varied production volumes. They are mobile in that they may be conveniently reallocated, moved quickly and used singly or in groups for other classes of work. Flexibility of tool set-up and functioning is also a feature. The machine has three slides, two universal and one plain, and each slide is individually controlled by a separate screw feed works. Application of a tailstock converts the machine into a center turning lathe. Auxiliary units can be provided for drilling and threading. Tool-holders are simple and may be quickly rearranged. Each of the three heads has 80 independent feed changes and there are 80 changes of table speed, with 800 r.p.m. the maximum. Rugged construction is a feature, and materials include various alloy steels, and a special high-strength, high wear-resisting alloy cast iron for slides.

Another full automatic lathe designed for small-lot as well as long-run production has a number of new features. Electrically controlled throughout, this machine employs magnetic clutches for carriage, tool-slide feeds and rapid traverse, and magnetic clutch and brake for spindle operation. Limit switches accurately control diameters and lengths of cut. No cams are used. Complete electrical control, both for set-up and automatic operation, is concentrated in a master control switch panel mounted in an elevated position at the tailstock end. The machine swings 15 in. over the bed ways and 7 in. over the carriages. The front carriage and tool slide are arranged so that they will pass the tailstock. This lathe may also be arranged to turn various diameters and lengths by means of a single-point tool on the front carriage, all movements being controlled by means of a template. Tools in the rear carriage can be used for facing and necking simultaneously.

Flexible Milling Machines for Both Small and Large Work

MILLING machines introduced during 1933 embraced several types, including rail, planer and planetary, and for both small and large work.

Automatic electrical table control features a new small machine for the high-speed milling of parts used in household appliances, firearms and the like. It is designed to use unusually simple fixtures, and as it can be set up and changed over quickly, it may be used economically for small-lot production. With the electrical control, changes in table movement can take place in rapid succession and less than ¼ in. from the point at which the movement started. Feeds range from 1 to 80 in. per min. and speeds from 187 to 1125 r.p.m. Rapid traverse is at 400 in. per min.

The rail-type milling machine is designed to use tungsten carbide cutters to the utmost, but can be furnished with speed ranges suitable for any other cutting materials. Unit construction permits the machine to be built in three different widths and in various lengths of feed. There are two vertical spindles on the cross-rail and one on each side housing, but other arrangements can be furnished. Speed and direction of rotation of each spindle are independent of any other. Four motors, all controlled from a central panel, are employed.

Work up to 120 in. wide, 90 in. high and 29 ft. long is handled by the planer-type miller built by another company. The machine is equipped with four independent unit heads, each of which is provided with a 15-hp. constant-speed reversible motor that drives the spindles through gears on short, anti-friction bearing shafts. This construction eliminates long-splined shafts and bevel gearing. The independent unit head design results in flexibility, as different size cutters may be used efficiently on each head. All motors are controlled from one panel and operated by convenient push buttons and pendant switches. They are interlocked and limit switches prevent over-travel of the various units. Bed, table and uprights incorporate a number of features designed to provide unusual rigidity and accuracy.

Speeding up of production beyond present standards while holding unusually close tolerances is claimed for a planetary milling machine having six heads that move continuously around a central supporting column. The machine performs operations in

(*Continued on Page* 127)

METAL CUTTING

From this crude chisel,
Painfully and painstakingly plied
By human hand, has sprung
The metal-cutting industry.
"Great oaks from little acorns grow."
This primitive man
With tedious blow on blow,
Was building better than he knew.

the general class of thread milling and circular milling. Automotive parts include differential carriers and housings, hubs, rear axle housings and the like. Threading includes pipe fittings; in ordnance work shells of all sizes can be handled. Production is pegged at a predetermined rate by means of timing gears; once started the machine is not stopped, even dull cutters being replaced without interfering with the continuous operation of the other heads. In combining six machines into one, floor space is saved and all six units may be operated by one man.

Two cam millers, as well as automatic production-type millers, and die sinking machines, were also brought out during the year.

Highly Developed Planers Available

ALTHOUGH no new planers were announced in the trade and technical press during 1933, evidence reflecting continued development was an indirect feature of a symposium on "Economics of Planing vs. Milling," at the annual meeting of the American Society of Mechanical Engineers early last month. A number of modern designs, most of them adapted to production uses, were shown by Forrest E. Cardullo, chief engineer of the G. A. Gray Co.

One machine for planing die blocks in an automobile plant is driven by a 50-hp. motor and is capable of taking two cuts each 3 in. x ⅛ in. in section. Cuts of the same cross-section are taken by an openside machine of frog and switch type which was especially developed for planing crossings.

A planer for machining guide rails of elevators has fixtures for holding eight 16-ft. long rails, and uses 48 tools, 40 of which are cutting at one time. Eight rails are machined every 22 min. In planing safe doors 36-in. deep, another modern planer is capable of taking two forming cuts, each 1/16 in. deep by 6 in. wide, 30 in. below the bottom of the rail. Cast-steel bolsters for freight cars are planed on a special machine equipped with six tools, four for planing the sides and two for planing the tops of the bolsters. The machine was provided with duplex control, and with guides for the rail tools analogous to the taper attachments used on lathes, so that very flat angles could be planed.

Planer with Duplex Tables

An extremely heavy 72 x 72-in. by 40-ft. machine with duplex tables for planing the rotors of turbo-generators was also illustrated. It is provided with two vees and two flats for supporting the table and is capable of carrying forgings weighing over 120 tons. The duplex tables were arranged so that one 20-ft. table can be loaded while the other is planing. Means are provided for automatically coupling the two tables by bringing the ends together, and for disconnecting them by turning a hex-head similar to an ordinary bolt-head, which releases the automatic coupling. When used as one table for planing the long work, the two halves are securely bolted together.

Standard planers equipped by the purchasers with special tools to greatly reduce the cost of machining parts manufactured in quantity were also pictured. One was furnished with a turret head carrying four tools, one of which was a gang of four bits, capable of producing five or six times the work which could be produced without the special equipment. A combination milling planer able to use both planer and milling tools with equal facility and advantage was also shown. The time required to change the machine from a planer to a miller and back again was said to be less than 30 sec.

Hobbing and Lapping Machines Feature New Gear Making Equipment

OF the ten or more new machines brought out last year for cutting or finishing gears, lapping machines predominated.

Hobbing equipment included a heavy-duty rotary hobbing machine featuring flexibility and high output in the production of spur and helical gears, spline shafts and worm wheels. The machine is made up of four, six or eight hobbing units, each equipped with individual motor and independent hob feed and speed changes, and functioning independently. The units are mounted on a table, rotation of which can be timed from 1 r.p.m. to one revolution in 16 min., through pick-off gears. The table will not rotate until the lubricant and coolant pumps are started. Several jobs can be handled simultaneously, and where one job requires more time than another, the unit performing it can be set to revolve twice around the table. The machine is fully automatic.

Requiring but 16 sq. ft. of floor space, compactness features another automatic hobbing machine brought out by the same company. The operator merely loads the work and presses a button. The cutter feeds in automatically at an accelerated speed to the full depth of cut, then feeds across the face at a constant rate, and upon completing the cut it backs out rapidly to clear the work for the return stroke. Return of the cutter to the starting position shuts off both the motor and the flow of coolant, and brings the machine to a complete stop, ready for reloading. Anti-friction bearings are used throughout, and lubrication, with filtered oil, is automatic. A micrometer stop permits changes in depth of cut to be made readily.

A machine that will cut gear racks with straight or helical teeth or with one side of the teeth forming an acute angle with the base line was introduced by another company. Operation is fully automatic, the table indexing from tooth to tooth. A disk type cutter is used. Gang cutters may be employed to cut several teeth of fine pitch simultaneously.

Automatic Gear Lappers Offered

Four or more gear tooth lapping machines have been introduced. One that operates on the crossed axes principle features rapid correction of involute curvature, helical angle, eccentricity and tooth spacing of heat-treated gears. Operation is automatic, and one operator can handle from four to six machines. Lapping time ranges from 2 to 5 min. The axis of the work gear arbor is set at an angle with that of the lap gear shaft, and the work gear is reciprocated constantly across the face of the lap gear, producing a continuous sliding of the lap tooth surface over the gear tooth surface in two directions simultaneously. Two types of lapping action are obtainable: in one each lap tooth contacts two teeth on the work gear simultaneously; in the other, each lap tooth contacts only one tooth of the work gear in any given direction. By means of automatic timing controls the lap is rotated a given number of revolutions in one direction, reversed for a given number of revolutions and stopped automatically.

In another gear-tooth lapping ma-

chine all the teeth of the gear are simultaneously in contact with the lap teeth. Laps are in the form of internal gears and are exact counterparts of the gears being lapped. The gear, mounted on a vertical spindle, moves up and down through the lap, helical gears being swiveled on their axis as they move through the lap. The gear is indexed several times during the operation so as to bring different teeth of the lap and gear into engagement, and thus assure uniformity in all teeth of the gear. Tooth spacing and profile are corrected and eccentricity is reduced. In addition the lapping operation crowns the tooth faces slightly which is said to promote quietness.

Another Machine Has Three Equally Spaced Laps

Three laps spaced equally around the work are employed in another gear lapping machine. Each lap may be set with its axis at an angle with the axis of the work, thereby producing a sliding action between the lap and gear teeth. The headstock and tailstock for supporting the work, either between centers or stub arbors, are mounted on a table which is oscillated at various speeds. This arrangement is claimed to assure even lapping throughout the full length of the gear teeth. Means are provided for regulating the length of time that each side of the gear teeth is lapped.

A four-spindle automatic gear lapping machine that employs a triple motion principle has also been placed on the market. This machine enables four gears (two pairs) to be lapped simultaneously, each spindle carrying one gear. The upper spindles reciprocate axially and the lower spindles reciprocate laterally.

Gear Finishing Machine Uses Helical Gear as Tool

Gear finishing machines, the cutting tool of which is an alloy steel helical gear, have been developed. The tool is gashed or slotted and cutting is accomplished by traversing the work axially while in contact with the revolving cutter. The machine cuts at an angle with the axis of the gear, and generates the shape of each tooth in the same direction as that taken by the teeth of two mating gears.

It is claimed by the builders of this new machine that profiles are corrected within 0.0002 in. of the true involute. Index, eccentricity and helical angle are also corrected and each tooth surface is made smooth and bright.

Welding and Cutting Feature Speed and Progress

TECHNICAL developments that increase both the speed and quality of work, and in some cases extend the field of application, marked all branches of the welding and cutting industry during 1933. Equally noteworthy was the wider range of application, especially in the field of machine construction. This included fabricating new products such as metal beer barrels; also machinery members that formerly were designed for other types of construction and, finally, very large structures, such as the Boulder Dam water gates and penstocks. Research, both individual company and cooperative, a conspicuous activity of the welding and cutting industry, has continued unabated.

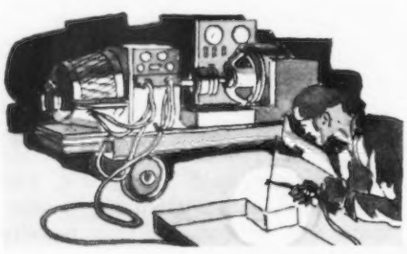
On the whole, the art of welding and cutting—and the equipment and supplies for these processes—has so advanced that upon resumption of pre-depression volumes, the metal-working industry will find at hand the means to new economies and quality of product. In this, the progress of the past year has contributed definitely.

Some of the outstanding equipment developments and impressive new applications of the past year are outlined in the following review.

Oxy-Acetylene Welding and Cutting

IN oxy-acetylene welding and cutting equipment the trend toward further refinement has continued. One company, for example, introduced blowpipes equipped with needle valves having a ball seat, claimed to give superior sealing properties. A hardened and highly polished stainless steel ball, held in a cage at the end of the valve stem, is employed. The same company introduced regulators having a double cone-shaped, bronze inlet screen filter to provide increased protection against entrance of dirt and other foreign matter. A new portable acetylene generator capable of producing 300 cu. ft. per hr, features improved design, and has, it is said, the largest rated gas capacity ever approved for portable service. Bronze welding and hard facing of all types have found wider application.

Increase in welded steel machinery construction has been accompanied by more extensive use of oxy-acetylene apparatus for cutting the shapes necessary for machine bases and other parts. The accuracy and smoothness of cuts produced under machine control are noteworthy. Mechanical flame cutting equipment has been developed to a high degree. Machines suitable for work of all classes and of almost any size or thickness are now available. They include manual and motor-driven, portable and stationary models, either partly or almost fully automatic in operation. Units equipped with as many as six torches, centrally controlled and guided, will flame cut up to six identical shapes simultaneously. Other machines crawl around pipes, making one or two square or bevel cuts simultaneously.



In addition there have been developments in flame machining, so named because it is similar in effect to many tool machining operations. It removes metal from the surface of the piece by surface oxidation, rather than severing the metal by linear oxidation, as in flame cutting.

Four New Machines Announced

Four or more new cutting machines were brought out last year. One is a portable unit for shop and field use. It consists of a blowpipe mounted on a motor-driven, air-cooled chassis designed to run either on track or on any relatively smooth plate. When operated on a track, straight-line cutting is performed automatically. When cutting simple shapes the machine is guided by hand. A radius rod permits automatic circle cutting.

Another machine is a straight-line cutting unit particularly adapted for trimming and beveling of plate—clean, finished cuts being made faster and much more accurately than by hand. This machine incorporates a steel channel base, a means for moving the blowpipe, and adjustments

for setting the blowpipe to cut bevels. Longitudinal and lateral motion is provided. Linear speeds up to 33 in. per min. are obtainable, and smooth action of the carriage, resulting in straight and steady cutting, is a feature.

The third machine is a stationary precision shape cutter for producing dies, cams and other parts requiring smooth and accurate contour, is designed to do all types of cutting, and has a longitudinal range of 44 in. and a lateral range of 20 in. The fourth new machine is a portable pipe cutting and beveling unit that employs a hand cutting blowpipe supported on an arm that is mounted on a center rod having three spreading arms that press against the inner wall of the pipe. The blowpipe is adjustable for angle of cut; when cutting, it is rotated by a hand crank.

Developments in Flame Machining

Flame machining, developed from flame cutting, was featured in last year's review. As stated, it uses the same fundamental principles of chemical reaction as the older process, but the cutting oxygen stream impinges at a more or less acute angle on the work. Oxygen orifices are of expanding low stream velocity type, and relatively low oxygen pressures are used. The cut is such that a predetermined depth and width of material is removed by the surface oxidation. Flame machining operations include flame planing, milling, turning, drilling, punching and flame boring, some of which are still in the experimental stage.

The process, to date, compares with rough machining, surface tolerances within 1/16 in. being maintained experimentally in some operations. Most of the work in this new field of cutting has been in plain and carbon steels, but it is expected that the process will be applicable also to certain alloy steels.

As an example of its effectiveness in removing metal we quote the following comparison: In a simple "turning" cut the flame machining process has removed from 1200 to 1800 lb. of metal per hour. In tool machining on a lathe making the same kind of cut, metal removal was at the rate of 550 to 650 lb. per hour for soft steel and from 115 to 160 lb. per hour for hard steel, using a depth of cut of ⅜ in., a feed of 0.0625 in., and surface speeds averaging 130 and 30 ft. per min., respectively, for the soft and hard steels.

Surface Planing a Step Beyond Deseaming

Flame "planing" embraces deseaming, hogging, and surface planing. Deseaming is used extensively in steel mills for removing cracks or seams in billets, slabs and rounds, and hogging applications include removal of superfluous metal on steel castings. Surface planing is a step beyond deseaming. The cuts are such that wide surfaces are removed, and when done with a mechanically guided flame, the limits as to depth and width of cut are said to be held within 1/16 to ⅛ in. of finished surface size.

Flame "milling" simulates the style of cuts produced by rotary mills in tool machining. Present applications include profile milling the edge of plates and back milling partially welded U-type butt joints. Cutting concave types of fillets along the edges of rolled steel plates or bars by flame milling is expected to provide a quick and economical substitute for machined fillets. A range of fillet profiles is considered possible, several of them being readily produced with ordinary deseaming nozzles.

Accurate punching of holes by flame "drilling" is considered well within the scope of the new oxy-acetylene cutting process. A form of this drilling is in cutting a round hole in the end of a billet for centering or piercing purposes. The oxygen lance is used handily in removing long bolts, frozen in place, without scoring the hole. Rough small-diameter holes of considerable depth can also be produced by modifications of the oxygen lance. Furthermore, flame drilling has proved successful in rivet cutting by surface oxidation of the heads, and as the preheating and the oxidation require only a few seconds, unusual speed and economy are secured without any scoring of the plates or sheets.

Voltages of Arc Welders Increased

IN arc welding, sets with higher amperages and voltages that meet the requirements of speed and heavy-coated electrode welding, as well as bare wire welding, continue to be developed. Means to assure better arc stability, more convenient operation, improved ventilation of the drip-proof housing models, and the elimination or minimizing of projecting parts also feature the new machines. Tractor models of unique design for field and railroad maintenance of way use are interesting additions to this year's new equipment. Special automatic machines for welding beer barrels, including one arc and one atomic hydrogen, have been developed. A number of new electrodes have been announced.

New arc welders offered by one maker have some 60 per cent greater welding capacity than the company's previous machines. Features include drip-proof housing with three-point louvre ventilation to assure cool operation. Reverse polarity switch with double scale meters, selective reactance and remote control are provided. A four-bearing, self-excited, dual-control arc welder for speed and shielded arc use was introduced by another company. Control handles are the only projecting parts, and these are protected from injury. By means of the dual control system the voltage and amperage may be set independently. This machine does not require an exciter, and idling loss is said to be very low.

Arc Welder With Magnetic Bridge Feature

A new magnetic bridge, unique short circuit winding and a dead front control panel feature another new line. The short circuit winding is said to deflect current fluctuations back into the main field, quickening recovery. The new magnetic bridge further aids arc recovery and stability and at the same time increases the welding range. These welders are made in 100 to 800 amp. sizes.

In a new "protected" arc welder, the complete mechanism, including motor, generator, exciter, controlling devices and all wiring, is inclosed in a heavy sheet-steel cylinder to protect the machine from falling objects, dust and moisture. An improved fan and ventilating system is featured. The welding range of the 300 amp. 40 volt unit is from 40 to 550 amp. Armatures of motor, generator, and exciter are on a single shaft to eliminate misalinement troubles, reduce friction and provide greater compactness. Ball bearings are used throughout.

A new 400-amp. direct-current welder for either bare or coated electrodes was brought out for heavy service, such as encountered in steel mills and shipyards. It is of unit frame construction. Polarity is reversed simply by turning a simple thumb switch.

The same company introduced a 400-amp. 40-volt, alternating-current

welder for work requiring a current range from 120 to 500 amp. It is offered both for general welding and production work, and for all types of electrodes. Directional ventilation, and cooling of even the recesses of windings is a feature. Both the welding current and arc voltage are adjusted by turning a single dial rheostat, and means are provided for instantly changing electrode polarity to suit the work.

Tractor Mounted Welders for Rail Maintenance

Three or more tractor-type welders have been added to equipment for railroad maintenance of way work. One is offered also for general field work, including pipe line construction, bridge repair and structural steel erection. The crawler-type tractor may be used for draw-bar work, the welder assembly being demounted merely by removing a few bolts. The welder is a standard unit using the shunt induction principle of arc stabilization.

Another tractor welder, an unusually mobile power supply unit, is capable of operating along the shoulder of the track entirely clear of the trains, can ascend slopes up to about 35 deg. and is stable in operation on side slopes of 45 deg. The machine is designed for reclaiming battered rail ends, cross-overs, repairing worn bridge structures, etc., but is useful also for furnishing auxiliary power for rail grinders, slotters, drills and other maintenance of way tools. The overall width of the tractor is 30 in., which allows the unit to travel along shoulders or between rails. The height from the ground to the top of the upper tread is only 36 in. Ease of handling the tractor and convenient control arrangements for welding and grinding are features.

The third machine for railroad maintenance of way work consists of a tractor upon which is mounted one or two single-operator welding generators with their control. This equipment also is designed to accompany welding operations closely, and avoids loss of power involved in the use of long leads. It can be removed from the right of way quickly to meet traffic conditions. The same company has developed a new 300-amp. engine-driven railroad-type arc welding set with a transverse wheel action and lifting bale that facilitates removal of the equipment from the rails.

Automatic Beer Barrel Welders

Automatic machines for welding metal beer barrels included a unit designed for both single and double-shell barrels. It employs carbon arc automatic welding heads, and is said to produce 30 or more barrels an hour. Usually the barrels are designed for either lap or butt welding; the edge forming the butt joint is coined and the resulting flange provides the necessary metal for the weld. The machines are equipped with either one or two heads, the latter when two circumferential seams are to be welded. When there are two seams in the same shell both are welded at the same time. Although operating simultaneously a few inches apart, neither arc affects the operation of the other. The welding heads remain stationary while the barrels are revolved automatically under the arc.

A novel machine was also developed for automatic atomic hydrogen welding of the circumferential seam of a stainless steel beer barrel. The barrel consists of a stainless steel inner shell with an outer shell of ordinary steel. The stainless steel liners are made up of two drawn thimble-shaped drums having edges accurately formed so that when butted together for welding the joint will be true. A drum is placed in each chuck of the welding machine and the edges of the two drums brought tightly together. The chucks are opened and closed hydraulically, and one of them is mounted on a sliding tail-piece. A standard automatic atomic hydrogen welding head is utilized, but a unique feature is the application of hydrogen to the inner surface of the seam, underneath the arc, while the weld is being made. This is said to result in a smooth, bright joint free from porosity. A 16-in. diameter barrel can be welded in approximately 1¾ min., including the time necessary for unloading and loading, it is expected that this machine will produce from 25 to 30 barrels an hour.

Electrode for Welding Cast Iron

DEVELOPMENTS in electrodes included one for welding cast iron by the shielded arc process. It is said not only to simplify welding procedure, but to produce welds having greater strength and ductility than the cast iron. This electrode has a steel core surrounded by a heavy flux coating. A feature emphasized is the low heat with which it can be used, thus reducing the danger of cracking. It is made in the ⅛-in. size only, and is used with approximately 80 amp. of current. Welding is done intermittently, not over a 3-in. bead being laid down at one time. As each bead is welded, it is peened lightly, thoroughly cleaned and allowed to cool somewhat before the next bead is deposited.

A new heavy mineral coated electrode for arc welding Cromansil steel is said to give a deposit of the same analysis and of the same physical properties as the parent metal. The same company announced an electrode which deposits a metal containing 4 to 6 per cent chrome and 0.50 per cent molybdenum, this material being particularly suited for welding petroleum refinery equipment. Heavy mineral coated electrodes especially suited for vertical and overhead, as well as flat, welding of mild steel were made available.

For welding electrolytic or deoxidized copper, a filler rod for use in conjunction with a "long arc" method of welding has been announced. Rapid welding and strength equal to the full strength of annealed copper is claimed, as well as high ductility and absence of warpage. The same procedure may be employed for welding copper to steel.

New heavily-coated electrodes for building up battered rail ends on railroads are said to provide a deposited metal which is tough and hard immediately after deposit. This hardness is further increased by the cold working that results from the passage of traffic over the weld. The same company also developed a special electrode for repairing high manganese frogs and switches.

Resistance Welder Built Largely of Aluminum

ANNOUNCEMENTS of new resistance welding machines were fewer than last year. An interesting development was a machine built largely of aluminum; the use of a non-magnetic housing is said to eliminate or subdue to a considerable extent the choking or retarding effect on the welding transformer. The transformer is of special design, and the machine is equipped with thyratron tube control. Mechanical operation is through an air cylinder control with a mechanically-operated foot switch, timed and synchronized with the thyraton control by means of solenoids.

Use of thyratron type controls for resistance welding, both seam and spot, was extended, such control equipments having found many applications, including manufacture of beer kegs of plain and stainless steels and aluminum. Greater uniformity and higher speed, and welding of stainless steel without discoloration are advantages emphasized.

For use in resistance welding of thin brass, aluminum, stainless steel and other sheets where very high kva.

is applied for a very short interval of time, a new type of tuner and controller has been brought out. It consists of a panel assembly on the front of which are mounted two Ignitron power tubes, two Grid-glow control tubes and three Grid-glow timing tubes, and a protective and an imitating relay. On the rear of the panel are mounted auxiliary parts such as small transformers, copper oxide rectifiers, resistors and condensers. The Ignitron operation is entirely electronically controlled. Inaccuracies due to relay action are said to be eliminated. The Ignitron tubes have no peak current limitations, and very high momentary currents may be passed through them without wear or injury. Welding period may be varied from one cycle, 1/60 sec., to 15 cycles in increments of one cycle.

The same company developed an electronic spot and projection resistance welder contact timer that controls the welding contactor in the primary circuit of the welding transformer and is accurate enough for installations requiring control of the welding current from 1/10 to 40 sec. Timing is controlled by an electronic tube circuit.

Another new automatic weld timer varies the time automatically in inverse proportion to the rate of current flow. Uniformly sound welds, irrespective of variations in voltage, conditions of electrode, thickness of material or amount of scale, rust or dirt is claimed. A rectifier tube which charges a fixed condenser in proportion to the rate of current flowing in the welding circuit. When the charge reaches an amount sufficient to pass current through two neon gas filled tubes, a small relay operates to open the relay that controls the main line contactor.

BETTER METHODS
BETTER MANAGEMENT

The Only Answer

Drop forgings are constantly under the pressure of competition of other materials. Drop forge code requirements of shorter hours and higher wages only make this competition stiffer. The only way to meet it is by better methods; better labor-aiding equipment.

The Erie Variable-stroke Board Drop Hammer will enable your hammermen to earn more at lower cost-per-piece to you. Note, in this picture, its simplicity; its easy treadling movement, which comes naturally to the operator, without any practicing. Applicable to all existing Erie Board Drops; available on new hammers at only slight cost.

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Improvements in Thermit Welding

IN thermit welding there have been gradual improvements. Street railway track maintenance and repair applications have grown in importance, offsetting much of the loss in new construction thermit welding resulting from the depression. With this has come improvements in technique, especially in the application of a new design of weld for street railway track, which is done without any interruption to traffic.

An outstanding steam railroad application of the past year was the continuous thermit welding of more than a half mile of the main line track of an Eastern railroad. The joint in this type of work is a combined pressure and fusion weld, in which the base and web of the rail are fusion welded and the heads pressure welded. As first planned, this installation called for an open joint at the end of each five welded rail lengths. But as the work progressed extremely hot weather was encountered and it was found that there was little or no expansion in the welded stretches, and no noticeable closing of the unwelded joints. It was then decided to weld all joints and thus make continuous the entire 2690 ft. of rail, an innovation in steam railroad work. It is expected that such long lengths of welded track will eliminate creepage and markedly reduce track maintenance.

Steel mill applications of thermit welding during the year included the repair of a fractured 12-ton rack used in a large ball press, a number of rolls, some as large as 40 in. in diameter, and other parts which failed in service. Minimum interruption of mill operations and permanent restoration of the broken machine

(*Continued on Page* 174)

The Farmer as a Metal-

ONE of the surprising facts revealed by the survey of the metal-working industry, the results of which are disclosed elsewhere in this number, was the unanimity of opinion regarding the importance of the farmer as a customer. A larger number of concerns in our industry expect to profit from increased farm prices than expect to profit from either railroad rehabilitation or the public works program.

This issue would not be complete, therefore, without a review of the position and prospects of agriculture. And Mr. Fiske has given, in the accompanying article, a comprehensive factual picture of the farmer in his relation to machinery and metal products.

WHEN and to what extent will farmers again reach into the markets that are closely allied to the steel industry? Basically, the farmer, like any other business man, can operate in a satisfactory way only when he confines his purchases to that part of his receipts which represents the difference between cost of production and selling price. Therefore, his problem is as much that of lower production cost as it is of selling price. He is also deeply concerned with the problem of assurance against loss and damage to stored crops as well as safe housing of live stock. Efforts put forth by governmental act can accomplish nothing more effectual than to place the farmer in a position to attack these problems. Most farmers acknowledge that low cost of production combined with a fair selling price, a combination that actually opens the market for their products, is the real key to the situation rather than governmental efforts at fixing or manipulating prices. Modern farm machinery and accessories will help materially in the solution of the problem.

Much blame for surplus production has been placed on mechanization, but statistics show that excess supply is primarily a result of curtailed markets. Production of wheat per capita in the 10 years from 1891-1900 was 8.34 bu. and in 1921-1930 it was 7.28 bu. Per capita production of rye, corn, oats, barley, cotton, wool, all cattle, milk, cows, sheep, and hogs, decreased from 1910 to 1930 during which period only wheat, flaxseed, rice and tobacco increased. It is necessary to look elsewhere than to mechanization for explanation of the apparent surplus of farm products.

Where Surplus Comes From

Surplus evidently comes from two other causes, (1) the decreased buying power of the American people and (2) increased production in foreign countries, which is, in the final analysis, a double threat because such a country may never again be a buyer and, further, it may actually compete in countries which remain on an im-

This rubber tired tractor readily pulls three 14-in. bases through slightly frozen ground.

Industry Customer

By ROGERS A. FISKE
Western Editor, The Iron Age

port basis. America built its export business on the solid ground of the efficiency of its farmers. It therefore becomes imperative that if lost foreign markets are to be regained, and it is those markets which in years past absorbed the troublesome surplus, farm operations must be revamped and costs of production must be lowered. It may be possible to force higher prices on the American people, but it must be admitted that in the world market, purchases will be made where the price is the lowest. However, whether or not it is desirable again to cut into the world market it still remains important to the farmer's income that he reduce costs of production to the minimum and eliminate waste and losses as far as possible.

Horses Versus Tractors

Contrary to claims made by a few people, the horse is not a menace to the machinery industry. Estimates made in January, 1920, placed the number of horses and mules on farms at 25,700,000. By 1933 the number had decreased to 17,100,000, and, interestingly, the greatest percentage drop has been during the last three years of depression. Should the decline continue at its indicated rate, there will be needed on American farms in the next 7 years over 1,000,000 new tractors, not counting those purchased for replacement.

Matching old methods against mechanization it is a simple matter to show the value of machinery. According to the United States Department of Agriculture, the 1932 wheat grower, with a price less than half that of 1896, actually received a gross return of one-third more for his labor than did the farmer in 1896.

	1896	1932
Labor hours per acre of wheat	8.8	3.3
Avg. yield per acre	12.4	13.2
Farm price per bu.	71.7	35.0
Total value of crop per acre	$8.89	$4.62
Gross return per hr. of labor	$1.01	$1.40

This is not an argument for low wheat prices, but it shows the advantage that will accrue to the efficient and modern farmer with advances in grain price levels.

Granting that the AAA is all that it is hoped to be, it must be recognized that if prices are to be based on cost of production, then more efficient methods must come on the farm or the consumer will be unduly penalized. Recent surveys clearly show how costs vary. On 20 farms in central Illinois the cost of corn production varied in

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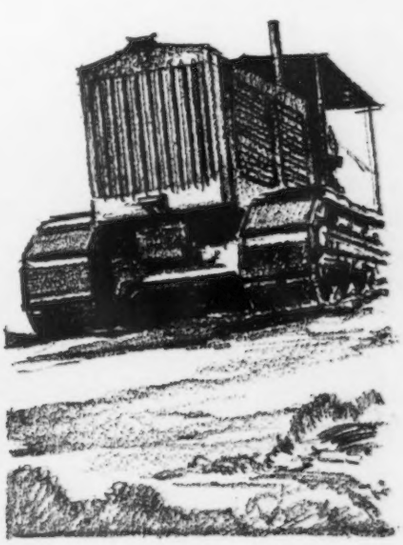
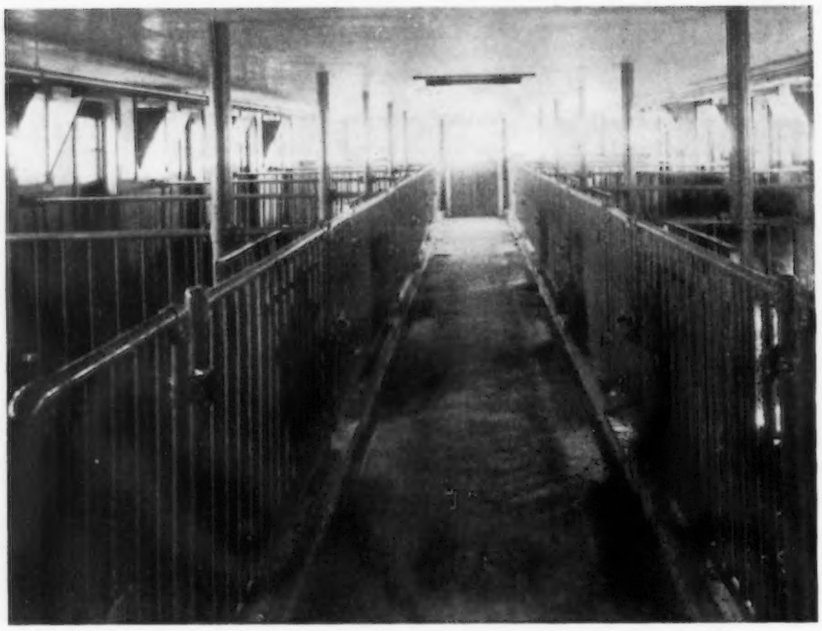
The modern tractor easily pulls a two-row corn picker-husker and a wagon into which the husked ears are delivered. Capacity of this machine is 12 to 20 acres a day, depending on conditions of land and crop.



1932 from 24.7c. per bu. to 35.9c., oats from 17.9c. to 29.1c., soybeans from 39.4c. to 91.4c. and winter wheat from 47.1c. to 78.2c. These figures, reported by the University of Illinois, cover all items of cost on farms that ranged from 150 to 536 acres, the average being 306 acres. The investment per acre averaged $174. In addition to the field crops mentioned these farms all produced milk, beef, cattle and hogs, as well as poultry as a sideline.

Just Where Does the Farmer Stand?

So much political thunder has been made of the farmer's plight that it will be well to give brief space to consideration of his economic situation. In the first place, "there are farmers and farmers." It is far from true that they are all complaining or that they are all in dire distress. For instance, 52 per cent of all Iowa farms are free from mortgage debt. Over 2,000,000 owner-operated farms in the United States, or 58 per cent, have no mortgage indebtedness. About 62 per cent of the mortgaged farms are mortgaged for less than one-half of their value, 32.5 per cent are mortgaged between one-half and full value and 5.2 per cent are mortgaged for more than full value, these figures being for 1930. In the past 3 years it has been practically impossible to make additional loans, so these figures have not changed materially. All told, American farmers have a three billion dollar floating debt and a nine billion dollar mortgage debt. In relation to total farm value these debts are not stupendous and, after all, large parts of these debts exist in normal times as the matter-of-fact way in which farmers normally conduct their business. About the worst picture that can be painted shows that farms are mortgaged only to about 20 per cent of total assets. This certainly is a far better showing than industry presents.

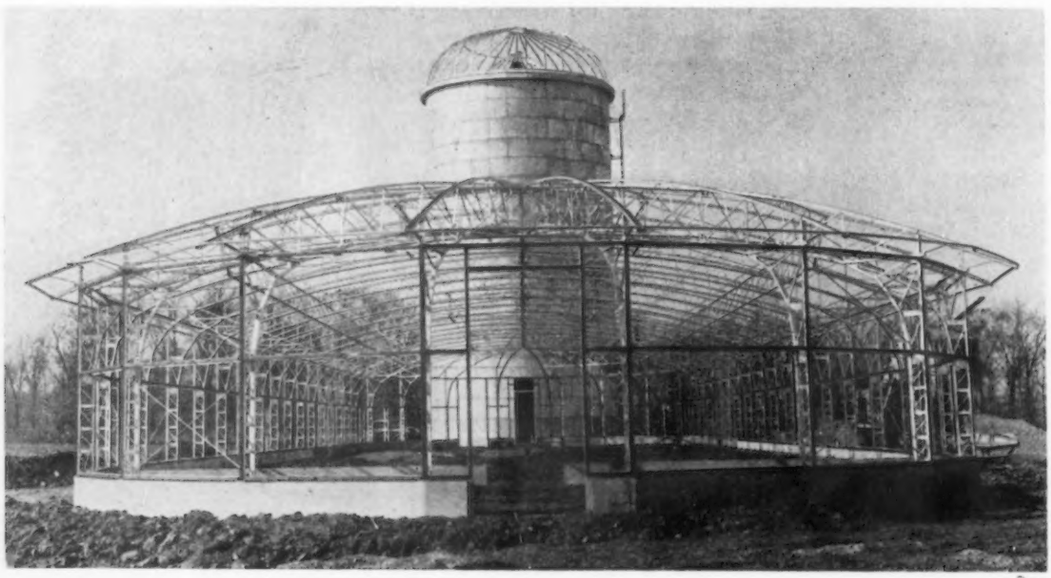


Steel is playing an increasingly important part in the equipment of modern barns.

The Farmer Wants to Spend

Is the farmer in a mood to buy? Now that he is getting process tax money, will he hoard, meet old obligations, or spend freely for the things he has been denied during the last few years? Various local surveys recently made in the central west, point definitely to the fact that the farmer wants to replace and bring up to date his farm equipment. He wants to cut cost of production. He is of necessity starting to pay bills owed his local merchants, who, in turn, are beginning to reestablish their credit. Collections of past-due accounts are better. It stands to reason that there must be a time lag while this maze of floating debt is being adjusted. It will not be cleared in its entirety because the farmer has always done business on a credit basis with payments arranged on the basis and time of receipts from crops. The country bank situation is still far from satisfactory and it is a definite check to the progress that could be the farmer's if he had somewhat near normal banking facilities.

A key to the future may be given by the record of domestic farm imple-



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A steel barn, 36 ft. x 126 ft. and a crop keeper, 24 ft. 8 in. x 45 ft., in the course of erection. Structures of this type are fire-proof.

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ment purchases, including repair parts, over a period of years.

Farm Implement Purchases

1924	$277,000,000
1925	340,000,000
1926	365,000,000
1927	392,000,000
1928	403,000,000
1929	458,000,000
1930	331,000,000
1931	210,000,000
1932	130,000,000

Foreign business had practically disappeared by 1931. The estimated backlog of unfilled domestic needs at the end of 1931 was 51 per cent of the average annual purchases. In 1932 it was 62 per cent and for 1933 the estimate was 70 per cent. These figures show the dire need for replacement and new equipment. The farmer is wasting time and money trying to keep obsolete and worn-out equipment in use. He knows the situation and will rectify it at the first opportunity. The automobile, while in a measure a luxury, is also a necessity, for it has changed methods of marketing and distribution, as well as the farmer's habits of buying and entertainment. It shares an important place in the unfilled needs of the farmer population.

Mail Order Business Increasing

From all indications the farmer is spending more money. Mail order houses, doing the bulk of their business in rural districts, showed November dollar volume sales increases for the first time since 1930 and sales in 1933 will exceed the total in 1932. While this expansion in purchases is going on, it must be noted that the farmer is looking closely at prices. His dissatisfaction with the NRA arises from the fact that he finds increases in prices for the things he must buy far offset gains he has made in prices obtained for his products.

He is applying this measuring stick to farm implements and at each purchase he must be shown, for instance, that repair parts comparable in size and quality are far below, in cost, similar parts that he may need for his automobile. It is up to the machinery manufacturer to prove the points of greater durability and productive usefulness of new machines against the old; of greater durability and less cost for maintenance; of reduction in loss of time due to failure; of increased efficiency in the use of energy; of increased capacity; and, of improved operating efficiency.

Indices of farm machinery quality values as set forth by the American Society of Agricultural Engineers afford measures of improvements. Some of the values are as follows:

	Index of quality value 1910-1914	1932
Grain binder	100	170
Cultivator	100	165
Farm engine	100	200
Hay loader	100	155
Mower	100	170
Corn picker	100	210
Tractor plow	100	190
Corn sheller	100	190
Manure spreader	100	180
Grain thresher	100	195

Farmers' operating seasons are longer than in years gone by. Farmers are plowing deeper and pulverizing soil more completely. They need the improved tools that are being offered. Use of wood, chilled iron and malleable iron have been greatly reduced, and iron and steel, brass, bronze, aluminum, etc., are more widely used. Steels formerly used have been replaced by well controlled carbon and alloy steels. Corrosion resisting metals are being introduced. Nickel, chromium, molybdenum, tungsten and manganese are common alloys and case hardening, nitriding and heat treating in general have brought forth uniformity and high quality never before attained in farm equipment. All of these factors must be given full weight before dollar com-

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FORMING
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Front and rear view of LW13 forming machine

This machine is used for forming miscellaneous shapes from light gauge metal. Yoder Cold Roll Forming Machines are equipped with anti-friction bearings and worm gear drive completely encased and running in oil.

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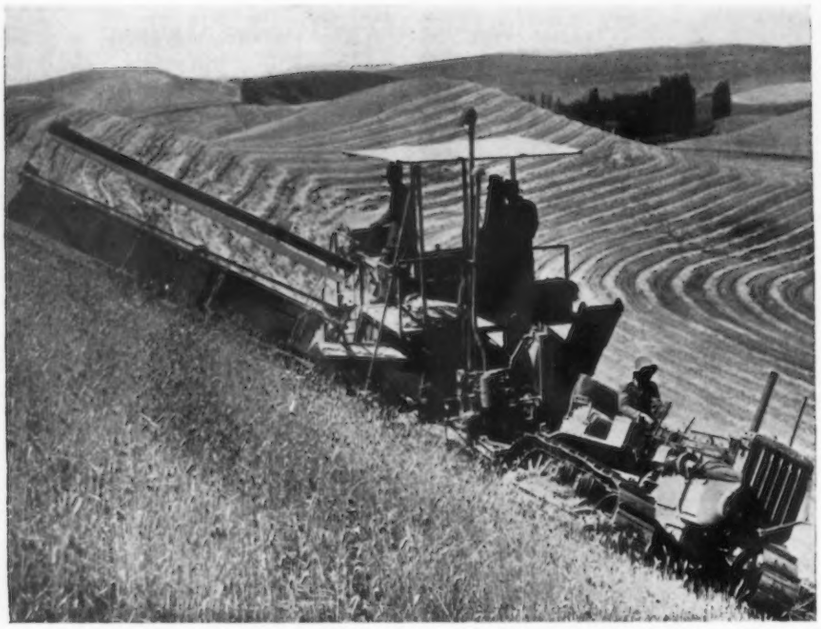

A hillside combine working on a 60-deg. slope near Pullman, Wash.

parisons can be made between the prices of modern equipment and machinery manufactured only a few years ago.

Export Opportunities for Agriculture

Outlook for foreign demand is mixed. The monetary policies of South American countries need radical adjustment before a real business revival can be looked for in that direction. Russia again offers an outlet, but only in a limited way, for such tools as are required for some of its newer phases of agriculture, as, for instance, the growing of cotton in southern Russia. It is expected that Russia will buy a limited number of the new tools needed in order to broaden its new activities and at once start to copy the American tools and go into production on them, thereby dropping away from the American market. It might be added that Russia has attained success in the manufacture of copied American machinery. For instance, the record of a Russian tractor assembly line is now fully equal to the average American practice, that is, two rejections out of 100 tractors assembled. The cheapened dollar is helping exports to Scandinavia, England, Syria, Palestine and all agricultural sections of Africa, particularly the northern part. Relatively higher prices have practically cut American manufacturers out of the Latvian market.

The back-to-the-farm movement in the United States has brought in little business for the reasons that this kind of farming is usually on small plots for subsistence only and the people who usually take it up are without funds and credit.

Wire Fencing Will Benefit

Producers of wire products and sheets look forward to the new year with confidence as to farmer activity. There is reason to believe that the AAA program will be of benefit at least as a stop-gap, and the hope exists that general business will continue to improve and offset any failure that might occur in the government's plan. In those sections of the country, notably the South, where process tax money has been distributed, farmers are squaring themselves with their merchant creditors. Roofing sheets and fencing have a definite life and in the case of sheets little replacement work has been undertaken in the past four years. The tendency to stop replacement of field fencing was first noticeable about 12 years ago, and here again is a stored-up demand which will be released as the farmer's buying power increases. The tendency in modern fence construction is to use a woven fence with several strands of barbed wire above it; a fence being so constructed is suitable for either small or large animals.

Country dealers are taking in more money against old bills and they are working some of this cash back where it eventually reaches producers of wire products, thereby reestablishing credit all the way round and starting once again the flow of goods. Russia, a heavy consumer of pork, is a potential buyer of fencing, but the size of that market is obscure at this time beyond the fact that Russia is strong-

(*Concluded on Page* 188)

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A new steel barn separated from the old structure by a fire-wall. Note insulation detail and outer metal sheathing. Sanitation is a simple matter in a structure of this type.

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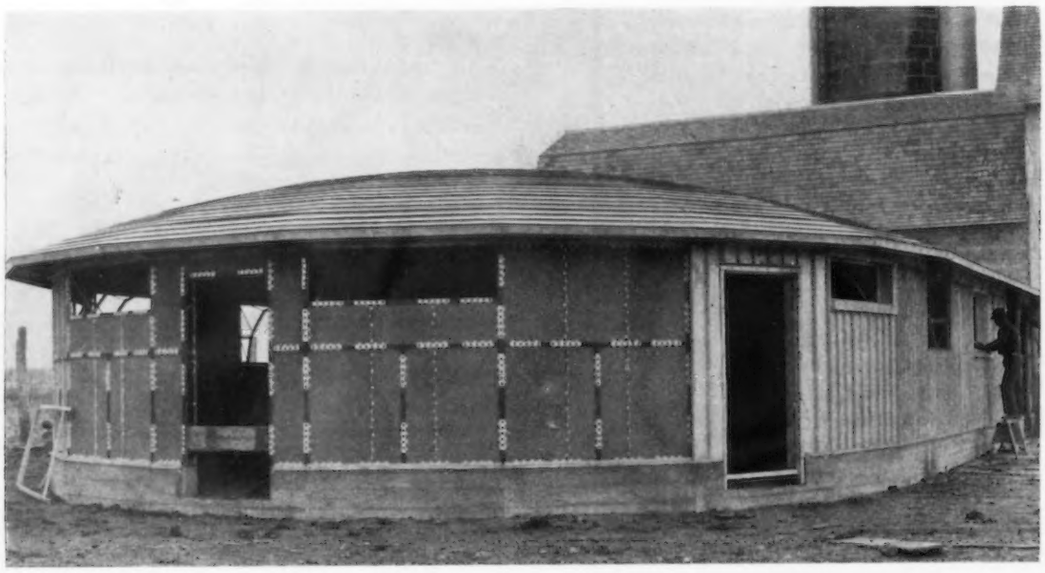

Iron and Steel Industry Completes a Year of Pronounced Recovery

MANY will remember 1933 as a year when depression reached its nadir—a year of panic, nation-wide banking paralysis and far-reaching Governmental intervention in business—but the iron and steel industry will recall the past 12 months as a period of pronounced recovery. Whereas raw steel production in 1932 fell to the extraordinarily low level of 13,464,402 tons, the lowest figure since 1901, output in 1933 reached almost 23,000,000 tons.

The gain was 71 per cent, sufficiently sharp to fulfill the expectations of the most optimistic, and, while it failed to bring the year's total up to the level of 1931, when 25,429,000 tons was produced, it instilled fresh hope and faith into an industry which had long been in the grip of gloom and despair.

The general belief that the worst is over has not blinded the industry to the perils that still exist in a complex and confused economic situation or to the artificial character of part of the business betterment that it has experienced. Speculative buying, prompted by price advances, has undoubtedly played a part—no one yet knows how large a part—in the increase in producers' bookings. And Government - sponsored expenditures are accounting for an important proportion of current purchases of materials by the railroads and by the construction industry. Activity growing out of private investment of capital remains at a low ebb and, so long as it does, must remain a source of great concern to those looking for signs of lasting economic recovery.

A Good Year in Automobiles

On the other hand, purchases of iron and steel by consumer goods industries have shown marked improvement. Nineteen thirty-three was a banner year in tin plate, indicating increasing production of sanitary packing cans and other containers. And 1933 was an excellent year in automobile production. Total output of motor cars in the United States and Canada, at 2,048,000, was 43 per cent greater than the 1932 total of 1,431,494.

The President's admirable handling of the banking crisis in March and the rise in employment that followed the subsidence of panic released a large volume of postponed purchases, which sustained motor car output until well toward the close of the year. The liquidation of retailers' stocks and the enthusiastic interest of the public in the new models now being brought out augur well for automobile production in coming months.

Beer Is a Factor

The steel industry has also benefited from heavier demands from manufacturers of electric refrigerators and other household equipment, and has received no little support from the reborn brewing industry. Beer has meant new equipment and new plants—all requiring iron and steel. Beer likewise has resulted in the development of a growing business in steel barrels and cases, besides restoring a lost market in cooperage steel.

The revival of distilling, following the recent passing of prohibition, promises to bring similar benefits to the steel industry.

Agriculture has been a poor customer for steel mills in the past year. Farm equipment plants enjoyed a brief spurt in their operations following the rise in the prices of agricultural products that attended our departure from the gold standard, but had to curtail again when the gap between prices of farm crops and manufactured goods widened out again. Late in 1933 the distribution of Government money in agricultural areas began to have a favorable effect on farmer purchases of wire products and hardware items and caused implement manufacturers to revise their schedules upward in anticipation of better spring trade.

Shipbuilding Aided by Navy Contracts

The shipbuilding industry was given tremendous impetus during the year by the placing of 21 naval vessels having a combined displacement of more than 100,000 tons. The Navy Department also placed orders with its own yards for 16 additional naval craft. Mills commenced rolling tonnage for these ships in the last quarter and the entire program will last through 1934. In addition to the bars, plates, shapes and sheets required were comparatively large amounts of stainless steel.

Increase in Finished Steel Exports

Export trade in iron and steel, thanks to dollar depreciation, has shown marked expansion. A year ago, when the United States was one of the few countries remaining on the gold standard, exports were largely shut off and imports were an increasingly disturbing factor, especially because of their deflationary influence on our price structure. Today, however, the situation is reversed, with American producers enjoying competitive advantages formerly enjoyed by their foreign rivals.

In the first 10 months of 1933 our iron and steel exports totaled 1,008,507 tons, compared with 484,482 tons in the corresponding period in 1932. A large part of the gain was in scrap shipments, the 1933 figure being 594,763 tons compared with 168,166 tons in 1932. The increase in finished steel exports was much smaller, the total for the 10 months being 354,571 tons in 1933 as against 256,650 tons in 1932.

Decline in Construction

Construction, long one of the main supports of the iron and steel industry, was apparently in smaller volume in 1933 than in 1932. Building projects undertaken in the first 11½ months of 1933, as reported for the 37 States east of the Rockies by the F. W. Dodge Corpn., involved expenditures of $1,171,366,100, as compared with a total of $1,351,000,000 in all of 1932. Almost 60 per cent of the work started in 1933 was financed by the United States Government.

Fabricated steel awards reflected the decline in construction, although estimated at 898,800 tons, they were not much below the 1932 total of 955,000 tons. In 1929, they were 3,598,000 tons. In the last quarter inquiry for fabricated structural steel began to increase as plans were rushed for PWA projects.

Railroad carloadings, which are regarded as a good index of the buying power of the carriers as well as an excellent barometer of general business, showed only a slight gain in 1933. Loadings of revenue freight up to and

including the week ended Dec. 9 totaled 27,428,389 cars, as compared with 26,764,372 cars in the corresponding period in 1932. The comparable 1931 figure was 35,626,453 cars.

As was to be expected, the railroads offered little support to the iron and steel industry during 1933. However, as the year ended, considerable business was promised as the result of loans to the carriers by the PWA. Production of rails was about 3 per cent over the abnormally low level of 1932, but was sufficient to engage the industry's capacity at only slightly above 10 per cent. Freight cars ordered totaled only 1964, as compared with 1968 in the preceding year and with 111,218 in 1929. Only 34 locomotives were purchased, as against 12 in 1932 and 1212 in 1929. The railroads undertook some repairs in their own shops which brought them into the steel market rather regularly, but the tonnage involved was not large. Increased carloadings during the summer forced the reconditioning of a certain amount of rolling stock which might otherwise have been left in bad order.

The Rail-Makers vs. Eastman

The controversy between four large steel companies and Joseph B. Eastman, Federal coordinator of transportation, over the price of rails was the most dramatic development in the railroad market during the year. During September, the coordinator tempted the mills with promised orders for approximately 800,000 tons of rails, to be financed by loans from the PWA, if they would reduce the price to "less than $35 a ton." The rail-making companies countered with a reduction from $40 to $37.75, which Mr. Eastman refused, charging collusion on the part of the sellers. He also sought to force the mills to reveal their costs of production unless they accepted the tonnage offered at $35. The controversy was settled at a White House conference where a compromise price of $36.37½ a ton was agreed upon.

Funds for the promised rail orders were set aside by the PWA, but, at the end of the year, the railroads had been rather reluctant to borrow under the terms offered. The Pennsylvania placed 100,000 tons of rails to be paid for with its own funds, even though it did borrow a large sum for electrification and freight car building. Rail orders from other roads to be financed by the PWA totaled less than 100,000 tons, but applications for loans were made in December which will probably triple this figure by the end of January. Including the equipment program of the Pennsylvania, loans were also obtained to finance the building of at least 20,000 freight cars and repairs to many thousands more.

The "Big Three" Compared with Steel

The railroads, construction and the automobile industry are the "big three" among steel buyers, having taken 45 to 57½ per cent of all finished steel produced in the years 1922 to 1932 inclusive. Yet, during the past 12 months, there has been no expansion in the activity of any one of these sources of demand comparable with the sharp increase in steel production. Construction work, according to the latest reports available, actually declined. Both railroad buying and railroad traffic made inconsequential gains over 1932. Automobile output rose substantially, but its gain of 43 per cent falls far short of the 71 per cent increase in ingot output. Among other sources of tonnage, the oil and gas industry has shown no expansion, leaving only containers and exports (a minor item) to show gains.

A Puzzling Problem

The problem puzzling the industry, therefore, is how to account for the large gain in steel output in the absence of compensatory increases in consumption among the conspicuous outlets for steel. Undoubtedly a considerable part of the discrepancy is accounted for by replenishment of inventories. So long as the trend of prices was downward inventories were kept at a very low level—so low in many cases as to prevent efficient plant operations. When the tide turned there was a general movement to rebuild stocks. The mere expansion of inventories to normal levels would, in a country as large as the United States, account for a huge quantity of material.

Whether or not consumers' stocks were increased above "normal" is difficult to say. At least it is impossible to give a single answer to the question. In the first place, depression rates of operation made it difficult for consumers to determine whether stocks were adequate or not. Normal inventories at one rate of operation might be far too small at another. Secondly, many buyers of iron and steel had such a poor credit standing, after their long struggle with deflationary influences, that they were unable to borrow for extensive purchases of materials. Nevertheless there is no gainsaying that there was considerable anticipatory buying throughout the last three quarters of the year.

Forward Buying Stimulated

The trend of prices, the monetary policy of the Government and the codification of the steel industry all operated as stimulants of forward buying. Finished steel prices, as measured by THE IRON AGE price composite, reached their low of the depression at 1.867c. a lb. on April 18, 1933. The banking crisis of March had nipped a first quarter recovery in the bud and had driven steel output down to 33,699 tons daily, or 15½ per cent of capacity, which was only slightly higher than the depression low of 31,360 tons a day (14½ per cent of capacity) reached in August, 1932. The lack of banking facilities curbed buying and impeded deliveries against past commitments. Finally, with the passing of the banking panic and our departure from the gold standard, there was a general fear that the Government would inaugurate an inflationary policy. This apprehension transformed a buyers' market into a sellers' market. Production rose rapidly, reaching 25.08 per cent in April and 34.11 per cent in May. Later the prospect of codification in the steel industry had a similar effect on buying, since it was clear that wage costs could not be further increased without raising price levels. Pre-code commitments raised output to 45.96 per cent in June and to 58.96 per cent in July, the latter rate being the peak for the year.

Sharp Increase in Shipments

The large volume of pre-code commitments was also reflected in the shipments of the United States Steel Corpn. After falling to the low for the year of 256,793 tons in March, the corporation's shipments rose steadily until they reached a high of 701,322 tons in July, the largest total for any month since May, 1931. August shipments were nearly as large, aggregating 668,155 tons. The corporation's subsequent shipments through November showed an uninterrupted decline. However, there is a strong possibility that December shipments exceeded those of either October or November. A gain in the last month of the year would be contrary to the seasonal trend and would find its explanation in code regulations which (with certain exceptions) provide for the cancellation of all contract tonnage unshipped at the end of a calendar quarter. In the case of bars, plates and tin plate, contract prices of which rose materially on Jan. 1, there was a strong incentive for consumers to accumulate as much tonnage as possible. Pig iron shipments were stimulated for a similar reason.

As a consequence of these developments, December production doubtless borrowed part of the tonnage that would ordinarily have reached the mills in January and February. The operations of tin plate mills, bar mills, plate mills and merchant blast furnaces may suffer for a time because of this anticipatory covering. However, a number of leading finished products, like sheets, strip, rails and structural steel for identified projects, were not affected in this manner and may show an increase in demand sufficient to offset the losses just noted.

So long as the tendency of prices is upward there will be a certain amount of protective covering. But there will probably be less under code regulations than formerly, since the code limits protection at a given price to a single quarter and requires buyers to take shipments of the entire tonnage

(*Concluded on Page* 176)

Pig Iron Output in 1933 Registers 52 Per Cent Gain Over 1932

Increase Falls Short of 71 Per Cent Rise in Ingot Production—Aftermath of Active December in Steel Is a Decline in Operations

PIG IRON production in 1933, according to final figures compiled by THE IRON AGE, showed a gain of 52 per cent over 1932, as compared with an estimated increase of 71 per cent in steel ingot output. The pig iron total for the year was 13,208,190 tons, compared with 8,686,443 tons for 1932. December output was 1,177,484 tons against 1,085,239 tons in November. The daily rate, at 37,983 tons, showed a gain of 5 per cent over the November average of 36,174 tons.

RAW steel production has declined to 31 per cent from 37 per cent a week ago. Increases are reported from only two producing centers, Cleveland and Detroit, the former's rate having risen three points to 50 per cent and the latter's seven points to 57 per cent. Operations are off seven points to 21 per cent at Pittsburgh, six points to 34 per cent at Chicago, two points to 29 per cent in eastern Pennsylvania, eight points to 30 per cent in the Valleys, two points to 41 per cent at Buffalo and 15 points to 35 per cent in the Wheeling area. Production in the Birmingham district is unchanged at 50 per cent of capacity. The downward trend is reflected also by the Steel Institute's report, which places operating schedules at 29.3 per cent for this week as compared with 31.6 per cent for the previous week.

THE decline in steel production is the aftermath of the heavy anticipatory specifications that were driven in during December. The greatest pressure for shipments last month was felt by wire mills, tin plate plants and bar mills. Two or three tin plate producers failed to complete shipments against contracts and have asked for extra days of grace on the grounds that their operations were delayed by unforeseen circumstances. Whatever the decision on these applications may be, the inflexibility of present contract stipulations has become a live issue. Those favoring a change argue that operating efficiency suffers when mills are forced to handle a large volume of last-minute orders. Others contend that a relaxation of rules to permit shipments to overlap into the first month of the succeeding quarter would merely postpone the contract deadline without necessarily relieving operating difficulties.

The recession in specifications has been especially marked in tin plate. Some tin mills are idle and the operations of others range from 25 per cent to a maximum of 60 per cent. Although consumers have doubtless built up their stocks, ultimate consumption is showing further gains, since the mobilization of unemployed at CWA camps and CCC cantonments is creating an unusually heavy demand for canned goods. Another favorable influence is a further expansion of export inquiries.

RAILROAD buying is still slow in materializing. The Erie is expected to issue an inquiry for 30,000 tons of rails some time this month, adding to the sizable pending tonnage already before the trade. Railroads, however, have until March 31 to place orders for rails and fastenings at present prices, and until June 30 to accept deliveries. Since Federal loans to carriers are interest-free for one year, borrowing roads will find it to their advantage to defer the beginning of the free period as long as possible. The leeway enjoyed by railroads in connection with rails is duplicated in the case of material for rolling stock, which is now treated as steel for identified structures, on which producers may quote for the life of the projects. The Pennsylvania is expected to place 35,000 to 40,000 tons of plates for 7000 cars within the next two or three weeks.

The Navy Department has ordered 9494 tons of plates, shapes and bars for the cruisers Brooklyn and Philadelphia and the gunboats Erie and Charleston. New York Shipbuilding Co. is low bidder on two tankers for the Standard-Socony Transportation Co., which will require 6700 tons of bars, plates and shapes.

THE automobile outlook is still clouded by difficulties in gearing up production for new models. Output last week receded rather than increased, and the December total may not exceed 70,000 cars. Ford's schedule, undisturbed by delays, remains at 50,000 units for January and 75,000 for February, but the operating troubles of other builders are likely to limit total January output for the industry to 150,000 units.

Awards of fabricated steel, at 9350 tons, compare with 11,825 tons last week and 17,500 tons two weeks ago. New projects of 11,500 tons include 2400 tons for a spillway bridge at Norco, La., and 2000 tons for the Midtown tunnel, New York.

Scrap, although not so buoyant as recently, has advanced at Chicago and Philadelphia, raising THE IRON AGE composite from $11.08 to $11.33 a ton. The finished steel and pig iron composites are unchanged at 2.028c. a lb. and $16.90 a ton.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Jan. 2, 1934	Dec. 26, 1933	Dec. 5, 1933	Jan. 3, 1933
Per Gross Ton:				
No. 2 fdy., Philadelphia	$19.26	$19.26	$19.26	$13.34
No. 2, Valley furnace	17.50	17.50	17.50	14.50
No. 2 Southern, Cin'ti	18.13	18.13	18.13	13.82
No. 2, Birmingham	13.50	13.50	13.50	11.00
No. 2 foundry, Chicago*	17.50	17.50	17.50	15.50
Basic, del'd eastern Pa	18.76	18.76	18.76	13.50
Basic, Valley furnace	17.00	17.00	17.00	13.50
Valley Bessemer, del'd P'gh	19.76	19.76	19.76	16.89
Malleable, Chicago*	17.50	17.50	17.50	15.50
Malleable, Valley	17.50	17.50	17.50	14.50
L. S. charcoal, Chicago	23.54	23.54	23.54	23.17
Ferromanganese, seab'd carlots	**85.00**	82.00	82.00	68.00

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$40.00
Light rails, Pittsburgh	32.00	32.00	32.00	30.00
Rerolling billets, Pittsburgh	26.00	26.00	26.00	26.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	26.00
Slabs, Pittsburgh	26.00	26.00	26.00	26.00
Forging billets, Pittsburgh	31.00	31.00	31.00	31.00
Wire rods, Pittsburgh	36.00	36.00	36.00	37.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.60

Finished Steel

Per Lb.	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.75	1.75	1.75	1.60
Bars, Chicago	1.80	1.80	1.80	1.70
Bars, Cleveland	1.80	1.80	1.80	1.65
Bars, New York	2.08	2.08	2.08	1.95
Plates, Pittsburgh	1.70	1.70	1.70	1.60
Plates, Chicago	1.75	1.75	1.75	1.70
Plates, New York	1.98	1.98	1.98	1.898
Structural shapes, Pittsburgh	1.70	1.70	1.70	1.60
Structural shapes, Chicago	1.75	1.75	1.75	1.70
Structural shapes, New York	1.95¼	1.95¼	1.95¼	1.86775
Cold-finished bars, P'gh	2.10	2.10	2.10	1.70
Hot-rolled strips, Pittsburgh	1.75	1.75	1.75	1.45
Cold-rolled strips, P'gh	2.40	2.40	2.40	1.90

Finished Steel

Per Lb.	Jan. 2, 1934 Cents	Dec. 26, 1933 Cents	Dec. 5, 1933 Cents	Jan. 3, 1933 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.25	2.25	2.25	2.10
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.35	2.35	2.35	2.20
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.85
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.95
Hot-rolled sheets, No. 10, P'gh	1.75	1.75	1.75	1.55
Hot-rolled sheets, No. 10, Chicago dist. mill	1.85	1.85	1.85	1.65
Wire nails, Pittsburgh	2.35	2.35	2.35	1.95
Wire nails, Chicago dist. mill	2.40	2.40	2.40	2.00
Plain wire, Pittsburgh	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., P'gh	2.85	2.85	2.85	2.60
Barbed wire, galv., Chicago dist. mill	2.90	2.90	2.90	2.65
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$4.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$12.50	$12.50	$11.50	$8.25
Heavy melting steel, Phila	**11.50**	11.00	10.00	6.75
Heavy melting steel, Ch'go	**10.00**	9.75	8.50	5.25
Carwheels, Chicago	10.00	10.00	9.00	7.00
Carwheels, Philadelphia	11.75	11.75	10.75	8.00
No. 1 cast, Pittsburgh	11.25	11.25	11.25	9.50
No. 1 cast, Philadelphia	12.50	12.50	11.25	8.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	8.50	6.25
No. 1 RR. wrot., Phila	11.00	11.00	11.00	7.50
No. 1 RR. wrot, Ch'go (net)	**8.75**	8.50	7.25	4.00

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.75	$3.75	$3.75	$1.75
Foundry coke, prompt	4.25	4.25	4.25	2.50

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery	8.00	8.00	7.75	4.75
Lake copper, New York	8.25	8.25	8.00	5.00
Tin (Straits), New York	**53.25**	52.87½	53.75	22.50
Zinc, East St. Louis	*4.35*	4.45	4.50	3.12½
Zinc, New York	*4.70*	4.80	4.85	4.39½
Lead, St. Louis	*3.90*	4.05	4.05	2.87½
Lead, New York	*4.00*	4.15	4.15	3.00
Antimony (Asiatic), N. Y.	7.25	7.25	7.25	5.40

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

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▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
Jan. 2, 1934	2.028c. a Lb.	$16.90 a Gross Ton	$11.33 a Gross Ton
One week ago	2.028c.	16.90	11.08
One month ago	2.028c.	16.90	10.00
One year ago	1.948c.	13.56	8.47
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	High	Low	High	Low	High	Low
1933	2.036c., Oct. 3	1.867c., Apr. 18	$16.90, Dec. 5	$13.56, Jan. 3	$12.25, Aug. 8	$6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.42, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

Post-Holiday Trading Inactivity Depresses Spelter and Lead Prices

Scattered Tonnages of January Lead Booked at 4c., New York Zinc Ignored at 4.70c. a lb.—Copper Unchanged—Tin Quiet

NEW YORK, Jan. 2.—The holiday period was marked by an additional constriction of consumer interest in all non-ferrous metals which reflected in price easiness in copper and sharp declines in lead and prime Western zinc.

The electrolytic copper market continues to receive only negligible consumer support, but the price remains unchanged at 8.25c. a lb., Valley points, as a result of improved market sentiment arising from more aggressive code activity. Neither custom nor outside interests are inclined to shade the current quotation, but reasonable tonnages can now be secured at 8.25c. for delivery positions well into the third quarter.

The general reluctance of lead consumers to book their January requirements caused major New York and St. Louis sellers today to open books 15 points lower at 4c. and 3.90c. a lb., respectively. An additional 10,000 tons of January metal is expected to be attracted by the lower price, and interest in metal for February delivery will also probably be sharply stimulated.

Several important zinc smelters are more inclined to force metal on the market, and the trading position of prime Western is consequently unsettled and somewhat weak. During the past seven-day period official quotations declined five points to the current basis of 4.70c. a lb., New York, and 4.35c., East St. Louis, for prompt and full first quarter positions. The open market is apparently inactive, but a few bookings are being quietly made by several important interests. The week's sales totaled less than 1000 tons, as compared with 1700 tons booked in the preceding period.

The holidays here and abroad seriously curtailed buying activity in tin during the week. The price of spot Straits at New York opened this morning at 53.25c. as a result of a stronger tone for sterling in the London exchange. A few parcels of Straits and English brands for prompt and first quarter delivery were booked today, but, for the most part, consumers are currently uninterested in new commitments. There is no selling pressure on the part of either importers or dealers.

Non-Ferrous Averages

The average prices of the major non-ferrous metals for December, based on daily quotations in THE IRON AGE, are as follows:

	Average
Electrolytic copper, N. Y.*	7.86c. a lb.
Lake copper, New York	8.11c. a lb.
Straits tin, Spot, N. Y.	52.91c. a lb.
Zinc, East St. Louis	4.47c. a lb.
Zinc, New York	4.82c. a lb.
Lead, St. Louis	4.04c. a lb.
Lead, New York	4.14c. a lb.

* Refinery quotations; price ¼c. higher delivered in Connecticut.

The Week's Prices. Cents Per Pound for Early Delivery

	Dec. 27	Dec. 28	Dec. 29	Dec. 30	Jan. 2
Electrolytic copper, N. Y.*	8.00	8.00	8.00	8.00	8.00
Lake copper, N. Y.	8.25	8.25	8.25	8.25	8.25
Straits tin, Spot, N. Y.	52.75	52.50	52.60	....	53.25
Zinc, East St. Louis	4.40	4.40	4.35	4.35	4.35
Zinc, New York	4.75	4.75	4.70	4.70	4.70
Lead, St. Louis	4.05	4.05	4.05	4.05	3.90
Lead, New York	4.15	4.15	4.15	4.15	4.00

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, 98-99 per cent, 22.90c. a lb., delivered; New No. 12, 18.50c. a lb., delivered.
Aluminum, remelt No. 12 (alloy), carload lots delivered, 12c. a lb., average for week.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingots, 36c. a lb., delivered.
Antimony, 7.25c. a lb., New York.
Brass ingots, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	55.00c. to 56.00c.
Tin, bar	57.00c. to 58.00c.
Copper, Lake	9.50c. to 10.25c.
Copper, electrolytic	9.25c. to 9.75c.
Copper, castings	9.00c. to 10.00c.
*Copper sheets, hot-rolled	15.00c.
*High brass sheets	13.75c.
*Seamless brass tubes	16.25c.
*Seamless copper tubes	16.25c.
*Brass rods	12.25c.
Zinc, slabs	6.00c. to 7.00c.
Zinc sheets (No. 9), casks	9.75c. to 10.00c.
Lead, American pig	5.12½c. to 6.12½c.
Lead, bar	6.12½c. to 7.12½c.
Lead, sheets	8.00c.
Antimony, Asiatic	8.50c. to 9.50c.
Alum., virgin, 99 per cent plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	31.00c. to 32.00c.
Babbitt metal, commercial grade	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	55.62½c.
Tin, bar	57.62½c.
Copper, Lake	9.125c. to 9.25c.
Copper, electrolytic	9.125c. to 9.25c.
Copper, castings	8.15c.
Zinc, slab	5.75c. to 6.00c.
Lead, American pig	5.00c. to 5.25c.
Lead, bar	8.00c.
Antimony, Asiatic	9.00c.
Babbitt metal, medium grade	19.75c.
Babbitt metal, high grade	59.62½c.
Solder, ½ and ½	32.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	6.12½c.	7.12½c.
Copper, hvy. and wire	5.87½c.	6.87½c.
Copper, light and bottoms	4.87½c.	5.62½c.
Brass, heavy	3.37½c.	3.87½c.
Brass, light	2.87½c.	3.37½c.
Hvy machine composition	4.50c.	5.25c.
No. 1 yel. brass turnings	4.25c.	5.00c.
No. 1 red brass or compos. turnings	4.00c.	4.75c.
Lead, heavy	3.00c.	3.625c.
Zinc	2.50c.	3.00c.
Cast aluminum	7.25c.	8.50c.
Sheet aluminum	11.25c.	12.75c.

Plates and Shapes in Naval Building Program

WASHINGTON, Jan. 2.—The Navy Department's proposed shipbuilding program would call for approximately 37,650 tons of plates and shapes in 1934 and approximately 125,775 tons up to 1939 by which time it is planned to build up to the treaty limit. The program for the present year, as recommended by Secretary of the Navy Swanson, calls for two destroyer leads and 12 destroyers, three cruisers and six submarines. The 1935-1939 program proposes the building of one aircraft carrier, three cruisers, 51 destroyers and 24 submarines.

Estimated tonnages follow:

	Total	Plates	Shapes
1934:			
14 destroyers	12,300	7,500 *	4,800
Three cruisers	21,000	13,875	7,125
Six submarines	4,350	3,600	750
	37,650	24,975	12,675
1935-39:			
Aircraft carrier	9,000	6,000	3,000
Three cruisers	21,000	13,875	7,125
51 destroyers	40,725	26,825	13,900
24 submarines	17,400	14,400	3,000
	88,125	61,100	27,025

Wheeling Steel to Add Strip Capacity

WHEELING, W. VA., Dec. 29.—The Wheeling Steel Corpn., today, announced the letting of a $1,000,000 contract for a continuous strip mill at its Yorkville, Ohio, plant to the Mesta Machine Co., Pittsburgh. The new mill, which will be ready for operation by July 1, will triple the capacity of the continuous strip department. The company also announced that its plant at Benwood, W. Va., will reopen Jan. 1, after having been closed for a month.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

	Soft Steel	Base per Lb.
F.o.b. Pittsburgh mill		1.75c.
F.o.b. Chicago or Gary		1.80c.
Del'd Philadelphia		2.04c.
Del'd New York		2.08c.
F.o.b. Cleveland		1.80c.
F.o.b. Buffalo		1.85c.
F.o.b. Birmingham		1.90c.
F.o.b. cars dock Pacific ports		2.30c.
F.o.b. cars dock Gulf ports		2.15c.

Rail Steel
(For merchant trade)

F.o.b. Cleveland	1.70c.
F.o.b. Chicago	1.70c.
F.o.b. Gary	1.70c.
F.o.b. Pittsburgh	1.65c.
F.o.b. Buffalo	1.75c.
F.o.b. Birmingham	1.80c.

Billet Steel Reinforcing
(Stock lengths as quoted by distributers; cutting to length, 60 in. and over takes extra of 10c. per 100 lb.)

F.o.b. P'gh mills	1.80c.
F.o.b. Birmingham	1.85c.
F.o.b. Buffalo	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Youngstown	1.85c.
F.o.b. cars dock Pacific ports	2.35c.
F.o.b. cars dock Gulf ports	2.20c.

(Cut lengths as quoted by distributers)

F.o.b. Chicago	1.95c.

Rail Steel Reinforcing
(Cut lengths as quoted by distributers)

F.o.b. Pittsburgh	1.75c.
F.o.b. Cleveland	1.80c.
F.o.b. Chicago	1.80c.

Iron

Common iron, f.o.b. Terre Haute, Ind.	1.60c. to 1.75c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	1.89c.
Common iron del'd New York	1.93c.

Steel Car Axles

F.o.b. Pittsburgh	2.50c.
F.o.b. Chicago	2.50c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Birmingham	1.85c.
Del'd Cleveland	1.885c.
Del'd Philadelphia	1.885c.
F.o.b. Coatesville	1.80c.
F.o.b. Sparrows Point	1.80c.
Del'd New York	1.98c.
F.o.b. dock cars Pacific ports	2.25c.
F.o.b. cars dock, Gulf ports	2.10c.
Wrought iron plates, f.o.b. P'gh	3.00c.

Floor Plates

F.o.b. Pittsburgh	3.20c.
F.o.b. Chicago	3.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.
F.o.b. Buffalo	1.80c.
F.o.b. Bethlehem	1.80c.
Del'd Cleveland	1.885c.
Del'd Philadelphia	1.905c.
Del'd New York	1.8525c.
F.o.b. cars dock, Gulf ports	2.10c.
F.o.b. dock cars Pacific ports (standard)	2.25c.
F.o.b. dock cars Pacific ports (wide flange)	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.00c.
F.o.b. Chicago mill	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base...2.45c. a lb. except at Bethlehem where the price is 2.55c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (½% Nickel)	$0.25
2100 (2½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Cold Finished Bars*

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.15c.
Bars, Cleveland	2.15c.
Bars, Buffalo	2.20c.
Bars, Detroit	2.30c.
Bars, eastern Michigan	2.35c.
Precision round bars, Pittsburgh	2.30c.
Precision round bars, Cleveland	2.35c.
Precision round bars (alloy), Pitts.	3.00c.
Shafting, ground, f.o.b. mill, 1⅛ in.	3.40c.
1-3/16 to 1½ in.	2.90c.
1-9/16 to 1⅞ in.	2.75c.
1-15/16 to 2⅛ in.	2.60c.
2-15/16 to 6 in.	2.45c.

* In quantities of 10,000 to 19,000 lb.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.75c.
No. 10, f.o.b. Gary	1.85c.
No. 10, del'd Phila.	2.04c.
No. 10, f.o.b. Birmingham	1.90c.
No. 10, f.o.b. dock cars Pacific ports	2.42½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.25c.
No. 24, f.o.b. Gary	2.35c.
No. 24, del'd Phila.	2.54c.
No. 24, f.o.b. Birmingham	2.40c.
No. 24, f.o.b. dock cars Pacific ports	2.95c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.30c.
No. 10 gage, f.o.b. Gary	2.40c.
No. 10 gage, del'd Phila.	2.59c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.00c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Gary	2.85c.
No. 20 gage, del'd Phila.	3.04c.
No. 20 gage, f.o.b. dock cars Pacific ports	3.45c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Gary	2.95c.
No. 24, del'd Phila.	3.14c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, f.o.b. dock cars Pacific ports	3.55c.
No. 24 Wrought Iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.25c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	2.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c.
No. 28, Gary	2.75c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate
(F.o.b. Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	1.75c.
All widths up to 24 in., Chicago	1.85c.
Cooperage stock, Pittsburgh	1.85c.
Cooperage stock, Chicago	1.95c.

Cold-Rolled Strips

F.o.b. Pittsburgh	2.40c.
F.o.b. Cleveland	2.40c.
Del'd Chicago	2.68c.
F.o.b. Worcester	2.60c.

Fender Stock

No. 20, Pittsburgh or Cleveland	3.10c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade

	Per Lb.
Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

Extras of 10c. a 100 lb. on joint carloads and 30c. on pooled cars and less-than-carload lots are applied on all merchant wire products. An allowance of $2 a ton is made to jobbers on straight, mixed or joint carloads; $3 a ton is allowed on less-than-carload shipments.

	Base per Keg
Standard wire nails	$2.35
Smooth coated nails	2.35
Galvanized nails:	
15 gage and coarser	4.35
16 gage and finer	4.85
	Base per 100 Lb.
Smooth annealed wire	$2.35
Smooth galvanized wire	2.70
Polished staples	3.05
Galvanized staples	3.30
Barbed wire, galvanized	2.85
Woven wire fence, base column	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Wrought Iron Inches	Black	Galv.
⅛	51½	29½	⅛	+91¼	+138
¼ to ⅜	57	38½	¼ & ⅜	+11½	+21½
½	62	50½	½	31½	15
¾	65½	55½	¾	36½	20½
1 to 3	67½	58½	1 & 1¼	39½	25½
			1½	43½	28
			2	41½	26

Lap Weld

2	63½	54½	2	37	22½
2½ to 3	66½	57½	2½ to 3½	38	25
3½ to 6	68½	59½	4 to 8	40	28½
7 and 8	67½	57½	9 to 12	38	24½
9 and 10	67	57			
11 and 12	66	56			

Butt Weld, extra strong, plain ends

⅛	48½	33½	⅛	+13	+45½
¼ to ⅜	54½	41½	¼ & ⅜	+2½	+34½
½	60	51	½	32½	17½
¾	64½	55½	¾	37½	22½
1 to 3	66½	58½	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	61½	53½	2	40	26
2½ to 3	65½	57½	2½ to 4	45½	33
3½ to 6	69	61	4½ to 6	45	32½
7 and 8	68	58	7 & 8	46	33
9 and 10	67	57	9 to 12	41½	30
11 and 12	66	56			

Discounts on steel and wrought iron pipe are net and not subject to any points or preferentials.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	33	1½ in.—1¾ in.	44
2½ in.—2¾ in.	40	2 in.—2¼ in..	13
3 in.—3¼ in.	44	2½ in.—2¾ in.	16
3½ in.—3½ in.	47	3 in.	17
4 in.	49	3½ in. to 3½ in.	18
4½ in. to 6 in.	42	4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap welded steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload 4 points under base and two fives. Charcoal iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five. Exception: On 1½ to 1¾-in. charcoal iron tubes no supplementary discounts are granted, and the discount for 10,000 lb. to a carload is 4 points under base and for less than 10,000 lb. 8 points under base.

Standard Commercial Seamless Boiler Tubes

Cold-Drawn

1 in.	48	3 in.	38
1¼ to 1½ in.	48	3½ to 3½ in.	41
1¾ in.	48	4 in.	43
2 to 2¼ in.	37	4½, 5 and 6 in.	36
2½ to 2¾ in.	34		

Hot-Rolled

2 and 2¼ in.	33	3¼ to 3½ in.	47
2½ and 2¾ in.	40	4 in.	49
3 in.	44	4½, 5 and 6 in.	42

In the case of all sizes except 1-in. to 1¾-in. cold-drawn boiler tubes supplementary discounts of two 5 per cents are allowed on carload lots. On quantities up to 10,000 lb. the base discount is reduced 10 points and a supplementary discount of 5 per cent only is allowed. On quantities 10,000 lb. to 24,999 lb. the base discount is reduced 6 points and a supplementary discount of 5 per cent only is allowed. On 25,000 lb. to a carload the base discount is reduced 2 points and supplementary discounts of two 5 per cents are allowed.

On 1 to 1¾-in. cold-drawn boiler tubes, there are no supplementary discounts. On quantities up to 10,000 lb. the base discount is reduced 12 points; on 10,000 lb. to 24,999 lb., it is reduced 8 points; on 25,000 lb. to a carload it is reduced 2 points.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, 60-lb. and heavier, per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$32.00
Light rails (from rail steel) per gross ton	31.00
	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.40
Spikes, ½ in. and smaller	2.40
Spikes, boat and barge	2.40
Tie plates, steel	1.90
Track bolts, to steam railroads	3.55
Track bolts, to jobbers, all sizes (per 100 count)	70 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh.	70, 25 and 10
Stove bolts in packages, Ch'go.	70, 25 and 10
Stove bolts in packages, Cleveland.	70, 25 and 10
Stove bolts in bulk, P'gh.	80
Stove bolts in bulk, Chicago	80
Stove bolts in bulk, Cleveland	80
Tire bolts	60

Large Rivets
(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago and Birmingham	2.85

Small Rivets
(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago and Birm'g'm	70 and 10

Cap and Set Screws
(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screw, 1 in. dia. and smaller	75, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ⅝ in. and smaller	75
Upset hex. head cap screw, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller	85
Upset set screws cut and oval point	75 and 10
Milled studs	65 and 5

STAINLESS STEEL

(Max. 16% Cr, 6% Ni, 0.15% C)
(Base Prices, f.o.b. Pittsburgh)

	Per Lb.
Bars	20½c.
Plates	24c.
No. 20 gage cold-rolled sheets	30c.
Hot-rolled strip	19½c.
Cold-rolled strip, 0.100 or over	25c.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Youngstown, Chicago, Gary, Buffalo, Cleveland, Birmingham.

	Per Gross Ton
Rerolling	$26.00
Forging quality	31.00

Sheet Bars

F.o.b. Pittsburgh, Youngstown, Cleveland, Chicago, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open-hearth or Bessemer	$26.00

Skelp

F.o.b. Pittsburgh, Youngstown, Chicago, Buffalo, Coatesville, Pa., or Sparrows Point, Md.

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$36.00
Cleveland	36.00
Chicago	37.00
Birmingham	39.00
Youngstown (del'd)	37.00

ALLOY STEEL BLOOMS, BILLETS AND SLABS

F.o.b Pittsburgh, Chicago, Buffalo, Massillon, Canton or Bethlehem.

Base price, $49 a gross ton except at Bethlehem, where it is $51.

CARBON STEEL FORGING INGOTS

F.o.b. Pittsburgh, Youngstown or Chicago.

Uncropped, $28 per gross ton.

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$3.75
Foundry, f.o.b. Connellsville Prompt	$4.25 to 5.25
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	10.50
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland delivered	9.27
Foundry, Birmingham	4.75
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.55 to $1.80
Mine run coking coal f.o.b. W. Pa.	1.80 to 2.00
Gas coal, ¾-in., f.o.b. Pa. mines	2.00 to 2.30
Mine run gas coal, f.o.b. Pa. mines	1.80 to 2.20
Steam slack, f.o.b. W. Pa. mines	1.30 to 1.40
Gas slack, f.o.b. W. Pa. mines	1.65 to 1.85

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	3.73c.
No. 5 industrial fuel oil	3.23c.
Per Gal. f.o.b. Cleveland	
No. 3 distillate	5.75c.
No. 4 industrial	5.50c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works: High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	43.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Chrome Brick

	Per Net Ton
Standard size	$45.00

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago	54.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	$65.00
Unburned, f.o.b. Baltimore	55.00
Grain magnesite, f.o.b Baltimore and Chester, Pa.	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

CAST IRON PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$44.00 to $45.00
4-in., del'd Chicago	47.00 to 48.00
6-in. and larger, del'd New York	43.00
4-in., del'd New York	46.00
6-in., and larger, Birmingham,	36.00 to 37.00
4-in. Birmingham	39.00 to 40.00

Class "A" and gas pipe, $3 extra.

Pig Iron, Ores, Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$18.50	$19.00	$18.00	$19.50
Bethlehem, Pa.	18.50	19.00	18.00	19.50
Birdsboro, Pa.	18.50	19.00	18.00	19.50
Swedeland, Pa.	18.50	19.00	18.00	19.50
Sparrows Point, Md.	18.50	....	18.00	....
Neville Island, Pa.	18.00	18.00	17.50	18.50
Sharpsville, Pa.	17.50	17.50	17.00	18.00
Youngstown	17.50	17.50	17.00	18.00
Buffalo	17.50	18.00	16.50	18.50
Erie, Pa.	17.50	18.00	17.00	18.50
Cleveland	17.50	17.50	17.00	18.00
Toledo, Ohio	17.50	17.50	17.00	18.00
Detroit	17.50	17.50	17.00	18.00
Hamilton, Ohio	17.50	17.50	17.00	18.00
Chicago	17.50	17.50	17.00	18.00
Granite City, Ill.	17.50	18.00	17.00	....
Duluth, Minn.	18.00	18.00	....	18.50
Birmingham	13.50	....	12.50	....
Provo, Utah	16.50	....	....	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District				
From Everett, Mass.	$19.00	$19.50	$18.50	$20.00
From Buffalo	19.00	19.50	18.50	20.00
Brooklyn				
From East. Pa. or Buffalo	20.77	21.27	20.27	21.77
Newark or Jersey City, N. J.				
From East. Pa. or Buffalo	19.89	20.39	19.39	20.89
Philadelphia				
From Eastern Pa.	19.26	19.76	18.76	20.26
Cincinnati				
From Hamilton, Ohio	18.51	18.51	18.01	19.01
Canton, Ohio				
From Cleveland and Youngstown	18.76	18.76	....	....
Columbus, Ohio				
From Hamilton, Ohio	19.50	19.50	....	....
Mansfield, Ohio				
From Cleveland and Toledo	19.26	19.26	....	....
Indianapolis				
From Hamilton, Ohio	19.77	19.77	....	....
South Bend, Ind.				
From Chicago	19.55	19.55	....	....
Milwaukee				
From Chicago	18.50	18.50	....	....
St. Paul				
From Duluth	19.44	....	....	....
Davenport, Iowa				
From Chicago	19.26	19.26	....	....
Kansas City				
From Granite City	20.04	20.54	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa. and Standish, N. Y.	$23.00
Johnson City, Tenn.	23.00
Del'd Chicago	28.65

GRAY FORGE PIG IRON

Valley furnace	$17.50

CHARCOAL PIG IRON

Lake Superior furnace	$20.50
Delivered Chicago	23.54
Delivered Buffalo	23.78

CANADA

Pig Iron

Per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard, (carload)	$85.00
Domestic, 80%, seaboard, (less carloads)	92.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$27.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.50
50% (ton lots)	85.00
75% (carloads)	126.00
75% (ton lots)	136.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads) (duty paid)	31.00
14% to 16% (less carloads)	38.50

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$22.25	12%	$29.25
7%	23.25	13%	30.75
8%	24.25	14%	32.25
9%	25.25	15%	33.75
10%	26.25	16%	35.25
11%	27.75	17%	36.75

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$27.25	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	94c.
Ferrotungsten, less carloads	$1.00
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c.
Ferrochromium, 2% carbon	16.50 to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del., per lb. contained V	$2.70 to $2.90
Ferrocarbontitanium, 15 to 18% per net ton, f.o.b. furnace in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorous, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	$36.00
Ton lots or less, per ton	41.00
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	85.00
2% carbon grade	90.00
1% carbon grade	100.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.5% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	4.50
High phosphorous, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	9.50c.
Iron, low phos., Swedish, average 63½% iron	9.50c.
Iron, basic or foundry, Swedish, average, 65% iron	9c.
Iron, basic or foundry, Russian, aver. 65% iron (nom.)	9c.
Manganese, Caucasian, washed 52%	22c.
Manganese, African, Indian, 44-48%	20c.
Manganese, African, Indian, 49-51%	21c.
Manganese, Brazilian, 46 to 48½	17c.

	Per Net Ton Unit
Tungsten, Chinese wolframite, duty paid*	$12.00
Tungsten, domestic scheelite*	$11.00 to $12.00

	Per Gross Ton
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	16.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic Seaboard	18.00

*Quotations nominal in absence of sales.

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines	$15.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	16.00
Foreign, 80% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	18.50
Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$12.25 to $12.75
No. 2 heavy melting steel	11.00 to 11.50
No. 2 railroad wrought	12.25 to 12.75
Scrap rails	12.25 to 12.75
Rails 3 ft. and under	14.00 to 14.50
Sheet car crops, ordinary	13.00 to 13.50
Compressed sheet steel	11.75 to 12.25
Hand bundled sheet steel	10.25 to 10.75
Hvy. steel axle turnings	10.25 to 10.75
Machine shop turnings	8.25 to 8.75
Short shov. steel turnings	8.25 to 8.75
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Cast iron carwheels	11.00 to 11.50
Heavy breakable cast	11.00 to 11.50
No. 1 cast	11.00 to 11.50
Railr. knuckles and couplers	14.00 to 14.50
Rail, coil and leaf springs	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
Low phos. billet crops	15.25 to 15.75
Low phos. sheet bar crops	14.50 to 15.00
Low phos. plate scrap	14.00 to 14.50
Low phos. punchings	14.50 to 15.00
Steel car axles	13.50 to 14.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$9.75 to $10.25
Shoveling steel	9.75 to 10.25
Hydraulic comp. sheets	$8.75 to $9.25
Drop forge flashings	7.75 to 8.25
No. 1 busheling	8.00 to 8.50
Rolled carwheels	11.00 to 11.50
Railroad tires	11.50 to 12.00
Railroad leaf springs	10.50 to 11.00
Axle turnings	8.00 to 8.50
Steel couplers and knuckles	10.50 to 11.00
Coil springs	11.50 to 12.00
Axle turnings (elec. fur.)	8.25 to 8.75
Low phos. punchings	12.50 to 13.00
Low phos. plates, 12 in. and under	12.50 to 13.00
Cast iron borings	6.00 to 6.50
Short shoveling turnings	6.00 to 6.50
Machine shop turnings	5.00 to 5.50
Rerolling rails	11.00 to 11.50
Steel rails, less than 3 ft.	12.00 to 12.50
Steel rails, less than 2 ft.	12.50 to 13.00
Angle bars, steel	10.50 to 11.00
Cast iron carwheels	10.00 to 10.50
Railroad malleable	11.00 to 11.50
Agricultural malleable	9.00 to 9.50

	Per Net Ton
Iron car axles	$11.50 to $12.00
Steel car axles	10.00 to 10.50
No. 1 railroad wrought	8.75 to 9.25
No. 2 railroad wrought	8.75 to 9.25

No. 2 busheling	$4.00	to	$4.50
Locomotive tires, smooth	9.00	to	9.50
Pipe and flues	5.25	to	5.75
No. 1 machinery cast	9.50	to	10.00
Clean automobile cast	9.00	to	9.50
No. 1 railroad cast	9.00	to	9.50
No. 1 agricultural cast	8.00	to	8.50
Stove plate	7.00	to	7.50
Grate bars	6.50	to	7.00
Brake shoes	8.50	to	9.00

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel			$11.50
No. 2 heavy melting steel			9.50
No. 1 railroad wrought			11.00
Bundled sheets			9.50
Hydraulic compressed, new	$9.50	to	10.00
Hydraulic compressed, old	7.00	to	7.50
Machine shop turnings			7.50
Heavy axle turnings			10.00
Cast borings	5.50	to	6.00
Heavy breakable cast			11.00
Stove plate (steel works)			9.50
No. 1 low phos. heavy	14.50	to	15.00
Couplers and knuckles	14.00	to	14.50
Rolled steel wheels	14.00	to	14.50
No. 1 blast furnace	5.50	to	6.00
Spec. iron and steel pipe	9.50	to	10.00
Shafting			15.50
Steel axles			14.50
No. 1 forge fire			10.00
Cast iron car wheels	11.50	to	12.00
No. 1 cast	12.00	to	13.00
Cast boring (chem.)	12.00	to	14.0
Steel rails for rolling			13.00

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$9.25	to	$9.50
No. 2 heavy melting steel	8.75	to	9.00
Compressed sheet steel	8.75	to	9.00
Light bundled sheet stampings	6.50	to	7.00
Drop forge flashings	9.00	to	9.50
Machine shop turnings	7.00	to	7.50
Short shoveling turnings	7.50	to	8.00
No. 1 busheling	9.00	to	9.50
Steel axle turnings	7.50	to	8.00
Low phos. billet crops	12.50	to	13.00
Cast iron borings	7.25	to	7.75
Mixed borings and short turnings	7.25	to	7.75
No. 2 busheling	7.25	to	7.75
No. 1 cast	10.50	to	11.00
Railroad grate bars	6.50	to	7.00
Stove plate	7.50	to	8.00
Rails under 3 ft.	14.00	to	14.50
Rails for rolling	10.50	to	11.00
Railroad malleable	11.75	to	12.00
Cast iron carwheels			11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$10.50	to	$11.00
No. 2 heavy melting scrap	9.50	to	10.00
Scrap rails	9.50	to	10.00
New hydraul. comp. sheets	9.50	to	10.00
Old hydraul. comp. sheets	6.50	to	7.00
Drop forge flashings	9.50	to	10.00
No. 1 busheling	9.50	to	10.00
Hvy. steel axle turnings	8.50	to	9.00
Machine shop turnings	7.00	to	7.50
Knuckles and couplers	12.00	to	12.50
Coil and leaf springs	12.00	to	12.50
Rolled steel wheels	12.00	to	12.50
Low phos. billet crops	13.50	to	14.00
Short shov. steel turnings	7.50	to	8.00
Short mixed borings and turnings	7.50	to	8.00
Cast iron borings	7.00	to	7.50
No. 2 busheling	6.50	to	7.00
Steel car axles	12.00	to	12.50
Iron axles	11.00	to	12.00
No. 1 machinery cast	12.00	to	12.50
No. 1 cupola cast	10.50	to	11.00
Stove plate	9.25	to	9.75
Steel rails, 3 ft. and under	12.00	to	12.50
Cast iron carwheels	11.00	to	11.50
Industrial malleable	11.50	to	12.00
Railroad malleable	11.50	to	12.00
Chemical borings	9.00	to	10.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel			$10.00
Scrap steel rails			9.00
Short shoveling turnings			5.50
Stove plate	7.00	to	7.50
Steel axles	11.00	to	11.50
Iron axles	11.00	to	11.50
No. 1 railroad wrought			7.00
Rails for rolling			10.50
No. 1 cast	9.00	to	9.50
Tramcar wheels	9.00	to	9.50
Cast iron borings, chem.			8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$9.50	to	$10.00
No. 1 heavy melting	8.50	to	9.00
No. 2 heavy melting	8.00	to	8.50
No. 1 locomotive tires	8.00	to	8.50
Misc. stand.-sec. rails	10.00	to	10.50
Railroad springs	10.25	to	10.75
Bundled sheets	6.00	to	6.50
No. 2 railroad wrought	8.25	to	8.75
No. 1 busheling	6.50	to	7.00
Cast iron borings and shoveling turnings	4.50	to	5.00
Rails for rolling	10.50	to	11.00
Machine shop turnings	4.25	to	4.75
Heavy turnings	5.50	to	6.00
Steel car axles	10.25	to	10.75
Iron car axles	12.50	to	13.00
Wrot. iron bars and trans.	9.25	to	9.75
No. 1 railroad wrought	6.25	to	6.75
Steel rails less than 3 ft.	12.00	to	12.50
Steel angle bars	11.50	to	12.00
Cast iron carwheels	8.00	to	8.50
No. 1 machinery cast	8.50	to	9.00
Railroad malleable	8.50	to	9.00
No. 1 railroad cast	8.00	to	8.50
Stove plate	6.50	to	7.00
Relay rails, 60 lb. and under	16.00	to	16.50
Relay, rails, 60 lb. and over	$20.00	to	$21.00
Agricult. malleable	9.00	to	9.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.00	to	$8.00
Scrap T rails	7.00	to	8.00
Machine shop turnings	2.00	to	2.50
Cast iron borings	4.00	to	4.25
Bundled skeleton, long	5.50	to	6.00
Forge flashings	4.75	to	5.00
Blast furnace scrap	4.75	to	5.00
Shafting	9.00	to	9.50
Steel car axles	8.50	to	9.00
Wrought pipe	3.50	to	4.00
Rails for rerolling	6.00	to	6.50
Cast iron borings, chemical	7.50	to	8.00

Per gross ton delivered consumers' yards:

Textile cast	$10.00	to	$10.50
No. 1 machinery cast	10.00	to	10.50
Stove plate	6.25	to	6.50
Railroad malleable	11.00	to	12.00

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.50	to	$8.00
No. 2 heavy melting steel	6.50	to	7.00
Heavy breakable cast	7.00	to	7.50
No. 1 machinery cast	7.50	to	8.00
No. 2 cast	6.50	to	7.00
Stove plate	5.00	to	5.50
Steel car axles	10.00	to	10.50
No. 1 railroad wrought	7.50	to	8.00
No. 1 yard wrought, long	$6.50	to	$7.00
Spec. iron and steel pipe	4.50	to	5.00
Forge fire	5.50	to	6.00
Rails for rerolling	8.00	to	8.50
Short shoveling turnings	3.00	to	3.50
Machine shop turnings	2.50	to	3.00
Cast borings	4.50	to	4.75
No. 1 blast furnace	2.50	to	3.00
Cast borings (chemical)	11.00	to	11.50
Unprepared yard iron and steel	3.50	to	4.00

Per gross ton, delivered local foundries:

No. 1 machinery cast			$9.50
No. 1 hvy. cast (cupola size)			7.75
No. 2 cast			7.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$8.25	to	$9.00
Scrap rails for melting	9.00	to	9.50
Loose sheet clippings	5.25	to	5.75
Bundled sheets	6.25	to	6.75
Cast iron borings	6.25	to	6.75
Machine shop turnings	5.75	to	6.25
No. 1 busheling	6.50	to	7.00
No. 2 busheling	3.50	to	4.00
Rails for rolling	9.50	to	10.00
No. 1 locomotive tires	9.00	to	9.50
Short rails	11.75	to	12.25
Cast iron carwheels	8.25	to	8.75
No. 1 machinery cast	9.50	to	10.00
No. 1 railroad cast	9.00	to	9.50
Burnt cast	6.50	to	7.00
Stove plate	6.50	to	7.00
Agricultural malleable	8.50	to	9.00
Railroad malleable	9.00	to	9.50

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$8.00	to	$8.50
Borings and short turnings	6.00	to	6.50
Long turnings	5.50	to	6.00
No. 1 machinery cast	8.00	to	8.50
Automotive cast	9.75	to	10.25
Hydraul. comp. sheets	8.00	to	8.50
Stove plate	6.00	to	6.50
New factory busheling	6.50	to	7.00
Old No. 2 busheling	5.00	to	5.50
Sheet clippings	5.50	to	6.00
Flashings	6.25	to	6.75
Low phos. plate scrap	8.50	to	9.00

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails, scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	3.50	3.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles, wrought iron	4.50	6.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	3.05c.
Structural shapes	3.05c.
Soft steel bars and small shapes	2.85c.
Reinforcing steel bars	3.00c.
Cold-finished and screw stock—	
Rounds and hexagons	3.20c.
Squares and flats	3.20c.
Hoops and bands, under ¼ in.	3.10c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.70c.
Hot-rolled sheets (No. 10)	2.85c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.32
Spikes, large	2.90c.
Small	2.65c.
Boat	2.90c.
Track bolts, all sizes, per 100 count,	65 per cent off list.
Machine bolts, 100 count,	65 per cent off list.
Carriage bolts, 100 count,	65 per cent off list.
Nuts, all styles, 100 count,	65 per cent off list.
Large rivets, base per 100 lb.	$3.25
Wire, black, soft ann'l'd, base per 100 lb.	2.90
Wire, galv. soft, base per 100 lb.	3.35
Common wire nails, per keg	2.65
Cement coated nails, per keg	2.65

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 9999 lb.

CHICAGO

	Base per Lb
Plates and structural shapes	3.10c.
Soft steel bars	2.90c.
Cold-fin. steel bars and shafting	
Rounds and hexagons	3.25c.
Flats and squares	3.25c.
Bands, 3/16 in. (in Nos 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.20c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.30c.
Hot-rolled sheets (No. 10)	2.85c.
Spikes (9/16 in. and lighter)	3.50c.
Track bolts	4.65c.
Rivets, structural (keg lots)	3c.
Rivets, boiler (keg lots)	3.10c.
	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Coach and lag screws	60 and 5
Hot-pressed nuts, sq., tap. or blank	60 and 5
Hot-pressed nuts, hex., tap. or blank	60 and 5
Hex. head and cap screws	85 and 10
Cup point set screws	75
Flat head bright wood screws	50 and 10
Spring cotters	60 and 10
Stove bolts in full packages	72½
Rd. hd. tank rivets, 7/16 in. and smaller	65
Wrought washers	$5.50 off list
No. 8 black ann'l'd wire per 100 lb.	$3.75
Com. wire nails, base per keg	2.70c.
Cement c't'd nails, base per keg	2.70c.

NEW YORK

	Base per Lb.
Plates	3.30c.
Structural shapes	3.27c.
Soft steel bars, small shapes	3.17c.
Iron bars	3.24c.
Iron bars, swed. charcoal	6.50c. to 7.00c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Cold-roll. strip, soft and quarter hard	4.00c.
Hoops	3.42c.
Bands	3.42c.
Hot-rolled sheets (No. 10)	3.17c.
Hot-rolled ann'l'd sheets (No. 24*)	3.65c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	4.75c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.30c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel ⅜ x ⅛ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open hearth spring steel, bases	3.75c. to 10.00c.
Common wire nails, base, per keg	$3.00
	Per Cent
Machine bolt, cut thread:	Off List
⅝ x 6 in. and smaller	60
1 x 30 in. and smaller	60
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
⅝ x 20 in. and smaller	50
Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.34c.
Bars, soft steel or iron	3.14c.
Cold-fin. rounds, shafting, screw stock	3.74c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Galv. sheets (No. 24)	4.54c.
Hot-rolled sheets (No. 10)	3.19c.
*Black corrug. sheets (No. 24)	3.99c.
Galv. corrug. sheets	4.59c.
Structural rivets	3.59c.
Boiler rivets	3.69c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller	60
Machine and carriage bolts, lag screws, fitting up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts	
1000 lb. or over	60
200 to 999 lb.	55 and 5
100 to 199 lb	50 and 5
Less than 100 lb.	50

*No. 26 and lighter take special prices.

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	2.75c.
*Structural shapes	2.75c.
*Soft steel bars, small shapes, iron bars (except bands)	2.75c.
‡Reinforc. steel bars, sq., twisted and deformed	2.505c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.30c.
*Steel bands, No. 12 to 3/16 in., incl.	3.05c.
Spring steel	5.00c.
†Hot-rolled annealed sheets (No. 24)	3.40c.
†Galvanized sheets (No. 24)	4.00c.
*Hot-rolled annealed sheets (No. 10)	2.95c.
Diam. pat. floor plates, ¼ in.	4.75c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For 5 tons or more, exclusive of cutting charge.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.21c.
Soft steel bars	2.90c.
Reinforc. steel bars	2.00c. to 2.50c.
Cold-finished steel bars	3.40c.
Flat rolled steel under ¼ in.	3.26c.
Cold-finished strip	5.55c.
Hot-rolled annealed sheets (No. 24)	3.76c.
Galvanized sheets (No. 24)	4.36c.
Hot-rolled sheets (No. 10)	3.01c.
Black ann'l'd wire, per 100 lb.	$2.45
No. 9 galv. wire, per 100 lb.	2.80
Com. wire nails, base per keg.	2.45

*Net base, including boxing and cutting to length.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.30c.
Bars, soft steel or iron	3.10c.
New billet reinforc. bars	3.10c.
Rail steel reinforc. bars	3.10c.
Hoops and bands, 3/16 in. and lighter	3.35c.
Cold-finished bars	3.55c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.45c.
Hot-rolled sheets (No. 10)	3.10c.
Structural rivets	4.00c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, 1-in., per 100 lb.	8.35
	Net per 100 Ft
Seamless steel boiler tubes, 2-in.	$17.69
4-in.	41.23
Lap-welded steel boiler tubes, 2-in.	16.42
4-in.	38.31

BUFFALO

	Base per Lb
Plates	3.27c.
Struc. shapes	3.15c.
Soft steel bars	2.95c.
Reinforcing bars	1.95c.
Cold-fin. flats and sq.	3.35c.
Rounds and hex.	3.35c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	4.00c.
Galv. sheets (No. 24)	4.15c.
Bands	3.32c.
Hoops	3.32c.
Hot-rolled unannealed sheets	3.07c.
Com. wire nails, base per keg	$3.00
Black wire, base per 100 lb.	3.25

BOSTON

	Per Lb
Beams, channels, angles, tees, zees	3.42c.
H beams and shapes	3.42c.
Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	3.43c.
Floor plates, diamond pattern	5.18c.
Bar and bar shapes (mild steel)	3.25c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.50c. to 4.50c.
Half rounds, half ovals, ovals and bevels	4.50c.
Tire steel	4.50c.
Cold-finished rounds and hexagons	3.70c.
Cold-rolled strip steel	5.20c.
Cold-finished squares and flats	4.20c.
Blue annealed sheets, No. 10 ga.	3.25c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Galvanized steel sheets, No. 24 ga.	4.60c.
Lead coated sheets, No. 24 ga.	5.65c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates, tank and U.M.	3.50c.	3.40c.	3.40c.
Shapes, standard	3.50c.	3.40c.	3.40c.
Wide-flanged beams and columns	3.70c.	3.60c.	3.60c.
Soft steel bars	3.55c.	3.40c.	3.40c.
Reinforcing bars	3.10c.	3.15c.	3.50c.
Hot-rolled annealed sheets (No. 24)	4.25c.	4.15c.	4.25c.
Hot-rolled sheets (No. 10)	3.75c.	3.65c.	3.65c.
Galv. sheets (No. 24)	4.85c.	4.75c.	4.85c.
Struc. rivets, ½ in. and larger	6.25c.	6.00c.	5.00c.
less than 100 lb.			
Cold finished steel			
Rounds	5.95c.	5.95c.	4.75c.
Squares and hexagons	7.20c.	7.20c.	6.00c.
Flats	7.70c.	7.70c.	7.00c
Common wire nails —base per keg			
less carload	$3.35	$3.25	$3.45

All items subject to differentials for quantity.

Car Building, Boiler and Other Codes

WASHINGTON, Jan. 2. — Total sales of the railroad car building industry during the first half of 1933 were but slightly more than 3 per cent of an estimated capital investment of $270,000,000. This statement was made by representatives of the American Railway Car Institute, sponsors of the code for the industry at a hearing last Wednesday before Deputy Administrator F. H. Kuhn. Presented by C. A. Little, president of the Pullman Car Mfg. Corpn., he said it has received approval by 20 members of the Institute. He pointed out that total business had dropped from $258,926,973 in 1929 to $7,523,000 in the first six months of 1933, with a consequent decrease in employment from 34,243 to 5920 workers. Mr. Little said that it was "extremely doubtful" whether the slight interest now observable in new purchases of the industry's products would continue if production costs were increased beyond the point proposed in the code.

F. A. Stevenson, also of the Institute, said the proposed 40-hr. maximum week would increase employment 20 per cent. A. R. Shannon, Jr., representing the NRA legal division, objected to what he characterized as "qualifications" of the proposed basic minimum wage of 40c. an hour and said they are too serious to find their way into any approved code. Both T. P. Kelly, representing the NRA Research and Planning Division, and Emil Kekich, representing the NRA Consumers' Advisory Board, objected to the proposal to have all bids deposited in advance with the Code Authority. Mr. Kekich, who presented a brief, said such a procedure might tend to collusion and allow departure from competitive practice. Mr. Kelly and Mr. Kekich also objected to the provision which would limit productive capacity. The actual cost formula likewise was the object of attack by Mr. Kekich.

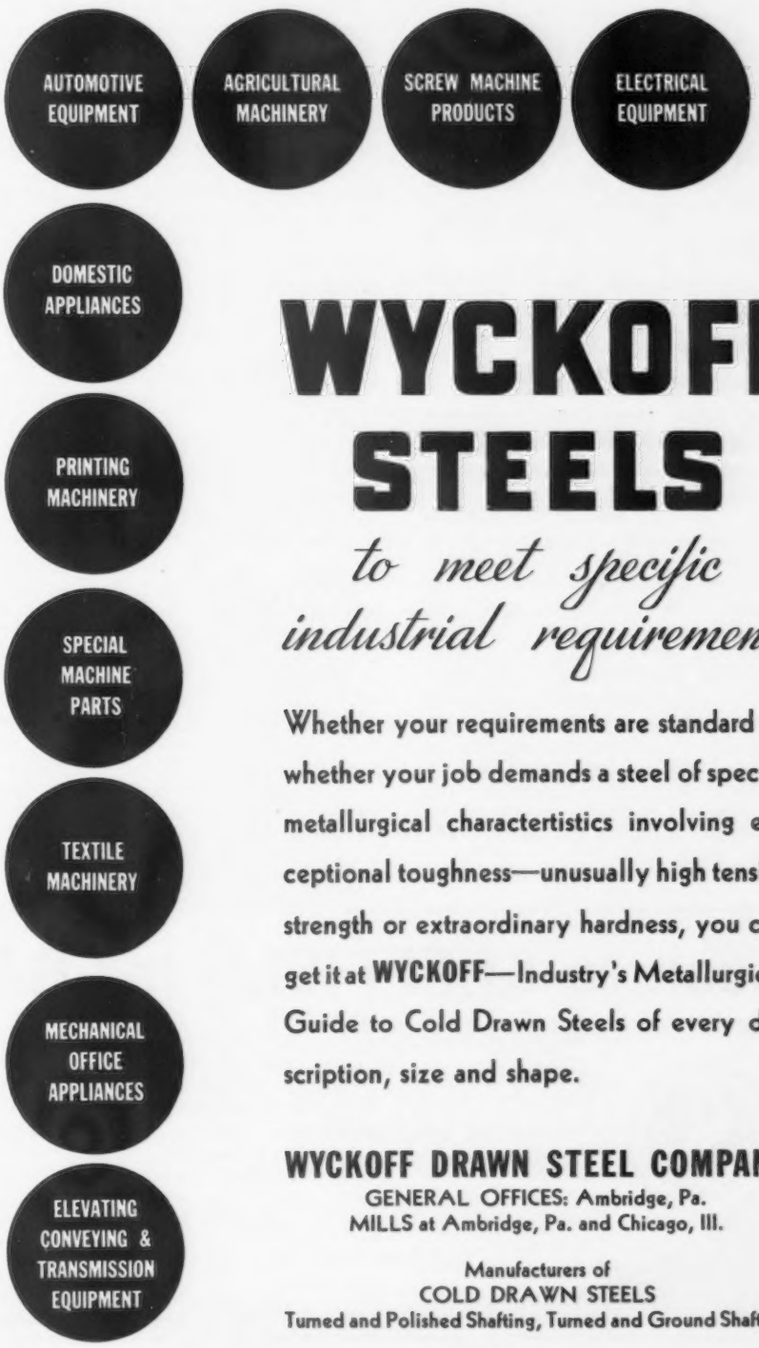
Walter J. Moyle of the Sun Shipbuilding Co. objected to certain features of an article in the boiler manufacturing code relating to sales below cost but suggested it might be clarified by the insertion of a definition to make clear the meaning of "price lists." Hearing on this code was held last Wednesday before Assistant Deputy Administrator Neil Foster. Objection to certain labor provisions was made by John B. Frey of the Metal Trades Department of the American Federation of Labor.

Hearings will begin Jan. 8 before Deputy Administrator H. O. King on four supplemental codes for the subdivisions of the Fabricated Metal Products Manufacturing and Metal Finishing and Metal Coating industry. The codes were submitted on behalf of the railroad car appliance, railroad hand brake, white casting and open steel flooring industries.

On the same day a hearing will be held before Assistant Deputy Administrator G. S. Brady on the code presented by the Clay Machinery Association.

Hearing was held last Thursday before Deputy Administrator Wilson Prichett on the code for foundry supply industry, which was presented by R. R. Bliss, representing Charles R. Stevenson, New York, president of the Foundry Supply Manufacturers' Association. Mr. Bliss submitted two amendments decided upon by the code committee. One provides that the Code Authority shall fix the date upon which the open price plan shall become effective, with notice to be given 30 days in advance. The other gives the Code Authority power to suspend the open price plan at any time, either in its entirety or as it applies to specific products of the industry.

Protest against the labor provisions was filed by P. J. Morrin on behalf of


AUTOMOTIVE EQUIPMENT
AGRICULTURAL MACHINERY
SCREW MACHINE PRODUCTS
ELECTRICAL EQUIPMENT
DOMESTIC APPLIANCES
PRINTING MACHINERY
SPECIAL MACHINE PARTS
TEXTILE MACHINERY
MECHANICAL OFFICE APPLIANCES
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MILLS at Ambridge, Pa. and Chicago, Ill.
Manufacturers of
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Turned and Polished Shafting, Turned and Ground Shafting

organized workers. The code provides for a 40-hr. week, with 48-hr. permissible six weeks in each six months to take care of peak demands and a wage rate of 40c. per hour for both male and female factory workers in all sections of the country.

No opposition was expressed at the hearing last Thursday before Deputy Administrator Brady on the code for the wire, rod and tube die industry, presented by L. C. Jacobson, New York, chairman of the Association of Wire, Rod and Tube Die Manufacturers. The code establishes a maximum 40-hr. work week of five days and a minimum wage of 40c. an hour. Details as to phraseology, definitions, etc., were discussed after the hearing between sponsors of the code and NRA officials.

Strong opposition met attempts to broaden the proposed code for the plumbago crucible industry to include the plumbago crucible and plumbago products industry, bringing in many members now seeking to come under the foundry supply code. Hearing on the code for the plumbago crucible industry was held last Thursday before Deputy Brady.

American-Japanese Trade Council Formed

NATIONAL FOREIGN TRADE COUNCIL announces the formation, under its auspices, of an American-Japanese Trade Council. Leading representatives of American and Japanese business interests in New York and other large cities of the United States have evinced a desire to discuss questions of reciprocal trade relationships. The immediate outcome of these preliminary discussions is the formation of the American-Japanese Trade Council. It is understood that six members of the National Foreign Trade Council—or their nominees—together with six representatives of the Japanese business interests will constitute an executive committee to consider all problems of mutual trade relationships.

Bad Business Leadership Criticized by Pew

"THE year just ended has been crowded with unprecedented events, pregnant with economic and social significance," says J. Howard Pew, President, Sun Oil Co., Philadelphia, in a statement made Jan. 1. "Three years of depression were climaxed with the bank holiday, which compelled resort, by a courageous national leadership, to vigorous reconstruction measures. These have produced gratifying results in reestablishment of faith, restoration of morale, and better business conditions. The outlook on the future is certainly more cheering at the year's end than it was in the early months.

"I cannot avoid the feeling, however, that we might have come farther on the way to recovery if business had been content to follow the direct road that was pointed out to it in the national recovery program. I refer to what seems to me a perversion of the industrial codes from an original simple purpose. The organization of business codes was symbolic of a nation-wide unity in seeking a way out. But in too many cases the effort has been to make the codes go too far. If they had been confined to shortening hours, increasing wages, expanding employment and eliminating child labor, I think more good would have come, and come sooner. Bad business leadership must bear the chief blame. Enlightened self-interest should have seen that a sound recovery plan must consider equally the interests of capital, labor and consumer. But instead of recognizing this obvious fact, altogether too many interests have tried to write into their codes provisions by which they could raise prices, eliminate competition, and increase profits. This caused contention, delay, doubts, and cynicism about the whole program. To the extent that they succeeded, such efforts were bound to destroy purchasing power and lower standards of living; to encourage monopolies, rouse public resentment, and lead to oppressive governmental regulation.

"These must be avoided if self-reliance, independence, initiative and enterprise are to continue as guides to American business. Our country has been made by men who risked, dared, experimented, invented, explored and pioneered. Under regulation and bureaucracy the genius of such men is certain to be stifled.

"If when we had prosperity we had all realized the need of effective buying power extending to all the people, our prosperity would have remained with us. More of industry's product would have been consumed, there would have been less for swollen profits, less temptation to excesses of speculation. And yet capital could have had ample reward for its every legitimate service.

"We all resognize these mistakes of the fat years. We ought to profit by their lesson. Instead, too many have sought to seize upon privileges, to insure high prices, to put the consumer at their mercy. Such efforts have been responsible for slowing down recovery. They have hampered a program which was inspired by the highest ideals and in which there was no place for narrow self-seeking. The fact that despite these hindrances so much has been accomplished is proof of the country's fundamental soundness."

Institute Moves to Larger Quarters

THE American Iron and Steel Institute has moved to larger offices on the thirty-third floor of the Empire State Building, New York. The institute has occupied quarters on the eighteenth floor for almost two years but expanding activities under the steel code made a change necessary.

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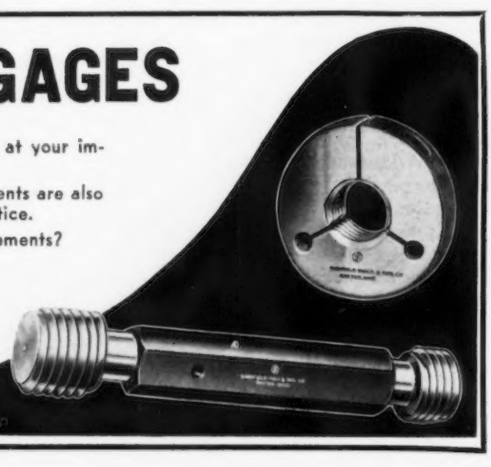


Pennsylvania R. R. Signs For $77,000,000 Loan

WASHINGTON, Jan. 2.—Declaring that work can begin immediately, Public Works Administrator Harold L. Ickes last Friday announced the signing of contracts with the Pennsylvania Railroad for a PWA loan of $77,000,000 to be used in completing the carrier's electrification between Philadelphia and Washington, together with the building of 7000 new freight cars and 100 electric locomotives. The Public Works Administration originally allotted $84,000,000 to be loaned to the Pennsylvania, but due to changes the company has made in its plans, the full amount will not be borrowed by it. When the allotment was made, the Pennsylvania planned to borrow from the PWA for doing some work that it now plans to finance otherwise, and for some other work that it decided to defer for a time.

Included in the work that the carrier will finance otherwise or defer for a time are the necessary changes in the Union tunnel in Baltimore and the Virginia avenue tunnel in Washington so as to permit the use of electric locomotives through them. Also included in these items are the conversion of a number of direct current locomotives for the use of alternating current and the conversion of a number of steam passenger cars into electric multiple-unit cars. Elimination of these items, together with a few other minor modifications in the original plans, account for the difference of $7,000,000 between the $84,000,000 and the $77,000,000 that will be borrowed. This reduction, Mr. Ickes said, will enable the Public Works Administration to reallot that sum to the other projects that are clamoring for consideration with the exhaustion of the $3,300,000,000 appropriation in sight.

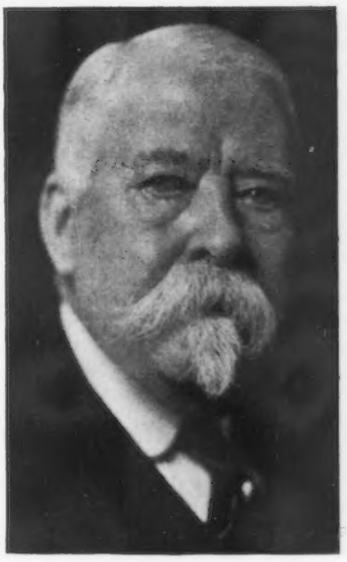
Delay in completing the Pennsylvania agreement was made necessary because of readjustment of many of the carrier's contracts by which work out of the PWA loan will be paid at the PWA rate of wages while that engaged under the carrier's own funds will be paid at the Pennsylvania's own scale of pay.

The agreement, Mr. Ickes stated, permits the largest private construction job in the United States to go ahead immediately, for concurrently with the negotiations on the contracts the Pennsylvania has been preparing for immediate large-scale resumption on its electrification program. Mr. Ickes emphasized the fact that the work will begin immediately, though in the steel trade doubt had been expressed that large steel contracts probably would not be placed for several months.

Approximately $32,000,000 of the money will be used by the Pennsylvania for the new cars and locomotives and $45,000,000 to complete electrification. The cars and locomotives will be assembled in the Pennsylvania's shops at Altoona, Pitcairn and Enola, Pa. Along the right of way from Washington to Philadelphia the carrier will erect the structures and install the equipment that is necessary for electric operation. Much of the structural steel has been rolled and fabricated and now lies along the right of way. It has not been indicated how much new tonnage for this purpose will have to be ordered.

Willis L. King Retires

WILLIS L. KING has resigned as vice-president and member of the executive committee of the Jones & Laughlin Steel Corpn. He will continue to serve as a member of the board of directors. His resignation, which terminates 64 years' active participation in the iron and steel industry, was made despite the insistence of his associates that he continue his services in the company. No other name has been identified with the steel industry longer than his. Since four years after the close of the Civil War, Mr. King has been continuously associated with Jones & Laughlin, which for some years has held a place among the three or four leading American steel producers. His career spanned many important changes in the industry. Most important of the changes which affected his own company was the practical abandonment of the manufacture of finished iron and the substitution of steel for all rolled products. At the age of 18 years, Mr. King was initiated into the industry with the Jones & Laughlin company. Iron was then the sole product of the industry. The company's annual output at that time was only 30,000 tons of puddled iron; its present rated yearly capacity is more than 3,600,000 tons of steel ingots. Mr. King played a prominent rôle in the company's growth, which was achieved without merger or consolidation with other producers. For many years he has been a prominent figure in the councils of the industry. Since the inception of the American Iron and Steel Institute in 1908, he has been one of its directors and for most of the interval one of its vice-presidents. In 1928 he was made its honorary vice-president. For his active part in the steel industry's affairs, he has been honored on many occasions. The American Iron and Steel Institute last May bestowed upon him the Gary Memorial Gold Medal for "outstanding achievement as a leader in inspiring high ideals and promoting confidence and good will in the welfare of the iron and steel industry." That citation summarizes a long and fruitful career.



WILLIS L. KING

Steel Awarded for Navy Vessels

WASHINGTON, Jan. 2.—Awards of 9494 tons of plates, shapes and bars for the cruisers Brooklyn and Philadelphia and the gun boats Erie and Charleston were made last week by the Navy Department. The lots consisted of 5914 tons of plates, 2851 tons of shapes and 729 tons of bars. The awards were as follows:

Plates: Central Iron & Steel Co., 1975 tons; Worth Steel Co., 1262 tons; Bethlehem Steel Co., 1112 tons; Lukens Steel Co., 1000 tons; American Sheet & Tin Plate Co., 565 tons.

Shapes: Bethlehem Steel Co., 1504 tons; John T. Hill (bidding for Phoenix Iron Co.), 1275 tons; Carnegie Steel Co., 72 tons.

Bars: Carnegie Steel Co., 729 tons.

Pittsburgh Scrap Men Rejoin Institute

THE Pittsburgh Scrap Iron Dealers Association, comprising over 80 per cent of the dealers in the Pittsburgh district, has voted to join both as a group and as individuals, the Institute of Scrap Iron and Steel. This group will now become officially the Pittsburgh chapter of the institute, which since 1932 has been inactive.

The following are temporary officers of the chapter: President, I. W. Solomon; vice-president, H. N. Trimble; secretary, Homer Stocker; and treasurer, J. G. McMillan.

Revision of NRA Probable to Help Small Concerns

WASHINGTON, Jan. 2.—Criticism by Progressive Republicans and organized labor apparently is an outstanding reason for plans of President Roosevelt which look to revision at an early date by the new Congress of the National Recovery Act. Led by Senator Borah of Idaho and Senator Nye of North Dakota, the act has been assailed as setting up monopolies in favor of big business to the disadvantage of small business and consumers. Organized labor is dissatisfied with the collective bargaining section and wants the power of the National Labor Board strengthened. It is contended that the board has been unable to compel "fair elections" among employees to choose their own representatives to deal with employers. While the National Labor Board was supposedly strengthened by a recent executive order of the President, aimed to give it authority for its past and future acts, there appears to be a growing realization that this alone cannot clothe it with the power which organized labor and its representatives on the board want it given.

In order to protect small business and consumers against socalled monopolies under the codes, it is understood the President, responsive to his own wish together with complaints of Progressive Republicans, will ask Congress for the creation of new machinery. Apparently it is proposed to create a new NRA board so as to provide better protection for small business.

Plans Not Yet Formulated

The plans of the President, though not yet tangible, were disclosed following a conference he held last week with National Recovery Administrator Hugh S. Johnson and Senators Borah and Nye. Indications growing out of the conference are that the President wants to establish closer contact between the executive and legislative branches of the Congress in order to keep the latter better informed as to the operation of the NRA.

Senator Borah has been particularly sharp in his attack on the proposed marketing and production agreements proposed under the oil code. He declared, in a letter to Secretary of the Interior Harold L. Ickes, in charge of administering the oil code, that the proposed agreements would be "unfair to the public" and that they would place "absolute dictatorial powers" in the hands of the big oil companies and threaten destruction of independent distributors. He has suggested that if prices are to be fixed that it be done through Government agencies. Senator Borah declared that since June 1 last gasoline prices alone, exclusive of other refined products, have increased at the rate of $486,000,000 annually, while the costs added by the code are only $125,000,000 a year.

Claim Danger of Monopolies

Both Senator Borah and Senator Nye claim that codes for the larger business interests often create monopolies in violation of the National Recovery Act. The President in giving his attention to this situation is said to be considering the setting up of an NRA board to safeguard anti-trust provisions, especially the one which says that codes "shall not promote monopolies or eliminate or oppress small enterprises." The problem has so many angles that it will require further study before action is taken. The matter of productive capacity of various units of an industry and other points enter into the situation. There is the thought that the matter may be handled without legislation and that the board, set up by executive order, could deal with the situation through fair trade practices in codes. It is not likely that any member of Congress would serve on the contemplated administrative agency but that Congressional committee might be set up at the suggestion of the President in order to keep in touch with operations of the NRA.

There is a sentiment, however, in favor of legislation to make clearer the relationship between the NRA and the anti-trust laws. Administrator Johnson has stated that there are misunderstandings in trade and industry with respect to the effect of the Recovery Act and of codes approved under the act upon provisions of the anti-trust laws. He has pointed out that trade and industrial groups are not exempted from the provisions of the anti-trust laws except in so far as they are expressly authorized to act in accordance with specific provisions of a code or agreement under the act approved by the President. Arrangements between members of an industry or trade to fix or maintain prices not expressly sanctioned by an approved code, he has declared, are therefore in violation of the anti-trust laws to the same extent as before passage of the Recovery Act. It is said that legislation bringing out these points may be offered as an amendment to the Recovery Act.

To Strengthen Labor Board

Legislation to strengthen the power of the National Labor Board is said to have been urged by organized labor because it feels that there is grave doubt as to its authority to compel elections under its own supervision for the purpose of establishing the right of collective bargaining. Senator Wagner, chairman of the board, and sponsor of the Recovery Act, apparently shares this view and it is said to have been brought to a focus in connection with the Weirton Steel Co. and the Budd Mfg. Co. cases. While action through the Department of Justice has been threatened in the former case and similar gestures have been indicated in the latter case, there are many who doubt that it will be or can be enforced. Both companies differ decidedly with the board as to the conduct of "fair elections" and maintain they have been held fairly and resulted strongly in favor of representation through company organizations.

Employee Representation

There is likewise doubt as to whether legislation could be enacted that would abolish the socalled company union. It is contended that it would be in violation of the constitution. Nevertheless, Senator Wagner has drafted for introduction in Congress an amendment to Section 7-a (collective bargaining section) of the Recovery Act, which would insure socalled "freedom of contract" to labor by insuring that workers shall have bargaining power equal to that of employers. Industrial interests contend that such power already exists. Senator Wagner's measure, details of which have not been disclosed, is said to propose Congressional authority to compel fair elections upon complaint of employees of alleged coercion or against company unions. The legislation, if enacted, and if enforceable, would have the effect of completely abolishing company unions and put into the hands of organized labor tremendous power to dominate labor relations with employers. Leaders of organized labor will meet in Washington on Jan. 24 to consider their legislative program and it is thought to be altogether probable that amendment to the collective bargaining section of the Recovery Act such as has been proposed will be recommended.

Senator Wagner is said to have asked the President to relieve him as head of the board because he feels that he cannot adequately serve both as a Senator and as chairman of the board. The President is said to be considering a successor to the Senator as head of the board.

N.A.M. Asks Investigation

Meanwhile, the National Association of Manufacturers has petitioned Congress to make an investigation of employer-employee relations before taking up any legislation on the subject. The petition declared that the proposal of Senator Wagner to broaden the authority of the National Labor Board presents "issues of peculiar gravity at this time."

In proposing an impartial investigation by a qualified Congressional committee, the association suggested that it be authorized to report upon:

(a) The facts as to the nature of

employment relations in industry and commerce, the viewpoint of employers and employees, the number of employees dealing individually or through various forms of collective bargaining with employers, and the prevailing characteristics of such forms.

(b) The nature and extent of Federal authority to deal with employment relations in industry and commerce.

The petition pointed out that recovery legislation has been in effect but six months and that the need of haste in enactment does not apply to amendment. Time, it was urged, should now be taken to ascertain the facts suggested, the authority of Congress and the quality and operating effect of the present administrative agencies, before drastic amendment is considered.

"The impression is constantly, but erroneously created that the only coercion existing in the field of employment relations is that alleged to be exercised by the employer over his employees," the petition declared. "Any legislation which is not predicated on inquiry into other demonstrable forms of coercion against employees, employers and the public by labor combinations will disregard our social history and experience, the familiar facts of our daily life and be grossly unjust to employers, employees and the people."

Reinforcing Steel

Awards 3450 Tons—New Projects 2800 Tons

AWARDS

Dover, N. H., 250 tons, road mesh, to American Steel & Wire Co.

Cape Cod, Mass., 1200 tons, bridges, to Concrete Steel Co.

Syracuse, N. Y., 1000 tons, New York Central grade crossing elimination; 500 tons to Patterson-Leitch Co., Cleveland, 500 tons to Concrete Steel Co.

Green Bay, Wis., 350 tons, sewage plant, to Truscon Steel Co.

Lynxville, Wis., 100 tons, dam across the Mississippi River, to Kalman Steel Corpn.

Fort Mason, Cal., 355 tons, pier No. 1 extension, to W. S. Wettenhall Co.

State of California, 180 tons, highway work in five counties, to unnamed bidders.

NEW REINFORCING BAR PROJECTS

State of Pennsylvania, 700 tons, County highway work, of which 500 tons is for Butler County; bids taken Dec. 29 by State Highway Commission.

Philadelphia, 500 tons, Philadelphia approach to Delaware River bridge; bids Jan. 15.

State of Illinois, 400 tons, road work; bids taken this week.

State of California, 130 tons, highway work in seven counties; bids Jan. 10.

State of California, 185 tons, highway work in four counties; bids Jan. 17.

Long Beach, Cal., 150 tons, reinforcing walls of City Hall; bids under advisement.

State of Oregon, 100 tons, highway work in nine counties; bids under advisement.

Pearl Harbor, Hawaii, 600 tons, fleet moorings at Navy Yard, W. P. Thurston, general contractor.

Fabricated Structural Steel

Lettings Decline—New Projects Also Lower

AWARDS of structural steel, at 9350 tons, compare with 11,825 tons last week and 17,500 tons two weeks ago. The bulk of lettings again was for public work and included 1500 tons for the Ruby Street bridge at Chicago, and 1200 tons for a dam in the Mississippi River at Saverton, Mo.; about 2500 tons of sheet piling was also awarded for this dam. New projects of 11,500 tons compare with 21,950 tons a week ago. The only sizable inquiries are 2400 tons for the Bonnet Carre spillway bridge at Norco, La., and 2000 tons for the Midtown tunnel at New York. Contracts reported in December totaled 79,925 tons, compared with 80,275 tons in November and 55,900 tons in October. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

New York, 700 tons, East River Savings Bank, Post & McCord, erectors.

Hampton Bays, N. Y., 430 tons, State highway bridge, to McClintic-Marshall Corpn.

Philadelphia, 190 tons, Government magazine and store house, to Phoenix Bridge Co.

Philadelphia, 212 tons, tank supports for Adam Scheidt Brewing Co., to Morris Wheeler & Co.

Lycoming County, Pa., 207 tons, highway bridge at Picture Rocks, to Lackawanna Steel Construction Co.

Buffalo, 100 tons, Chevrolet service station, to R. S. McMannus Steel Corpn.

Ulster County, N. Y., 125 tons, highway bridge, to American Bridge Co.

SOUTH AND SOUTHWEST

Flagstaff, Ariz., 125 tons, bridge, to Allison Steel Mfg. Co., Phoenix, Ariz.

Quantico, Va., 570 tons, Marine barracks, to Ingalls Iron Works.

Buena Vista, Va., 300 tons, highway bridge, to Roanoke Iron & Bridge Works.

Cherokee and Houston Counties, Tex., 340 tons, highway bridge, to Houston Structural Steel Co.

Burleson County, Tex., 100 tons, highway bridge, to Virginia Bridge & Iron Co., Inc.

CENTRAL STATES

State of Illinois, 125 tons, bridge to Vincennes Bridge Co., Vincennes, Ind.

Joliet, Ill., 1500 tons, Ruby Street bridge, to Milwaukee Bridge Co.

Detroit, 275 tons, brewery, to Whitehead & Kales.

Chicago & North Western Railroad, 170 tons, bridge on Iowa Division, to McClintic-Marshall Corpn.

Clinton, Iowa, 200 tons, school building, to Clinton Bridge Works.

Prairie du Chein, Wis., 150 tons, to Wassau Iron Works.

Saverton, Mo., 1200 tons, dam across Mississippi River, to Independent Bridge Co.

Saverton, 2500 tons, piling for a dam across Mississippi River, to Inland Steel Co.

State of Kansas, 485 tons, Coffey County bridge, to St. Joseph Structural Steel Co.

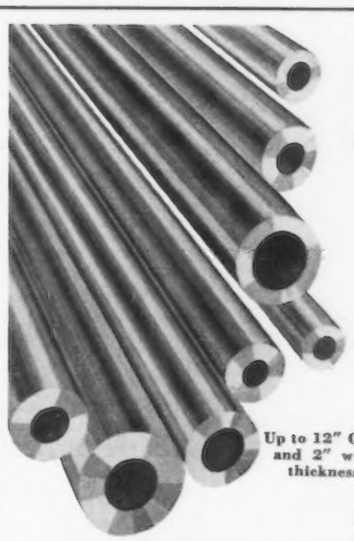
WESTERN STATES

Fort Peck, Mont., 350 tons, Federal building, to Minneapolis Bridge Co.

State of Montana, 160 tons, bridges in three counties, to unnamed bidders.

State of California, 180 tons, Santa Anna River bridge, to Kyle Steel Construction Co.

Sheridan County, Wyo., 125 tons, State bridge, to an unnamed bidder.



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CUTTING DIES
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THE BISSETT STEEL CO., INC.
945 E. 67th ST. CLEVELAND, OHIO
Cincinnati Pittsburgh Buffalo

San Francisco, 500 tons, cranes for Trans-Bay bridge, to an unnamed bidder.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

New York, 2000 tons, Midtown tunnel; bids to be taken Feb. 6.

Quincy, Mass., 100 tons, Fore River bridge substructure.

Hamden, Conn., 200 tons, building for Brooke Hall Dairy.

White Plains, N. Y., 150 tons, building for Brown Buick Co.

Philadelphia, 400 tons, turbine foundations for Philadelphia Electric Co.

Chestertown, Md., 220 tons, Morgan Creek bridge.

SOUTH

Illinois Central Railroad, 900 tons, viaduct at Big Clifty, Ky.

State of Alabama, 400 tons, bridges.

State of Florida, 640 tons, highway bridges at Branford and Pensacola.

Louisiana-Arkansas Railway, 2400 tons, Bonnet Carre spillway bridge at Norco, La.

State of Mississippi, 200 tons, two highway bridges.

CENTRAL STATES

Belle View, Iowa, 1200 tons, Lock No. 12, Mississippi River.

WESTERN STATES

State of California, 145 tons, highway work in Ventura and Monterey counties; bids Jan. 17.

State of Oregon, 210 tons, highway work in nine counties; bids under advisement.

Mare Island, Cal., 400 tons, cranes for Navy Yard; Harnischfeger Sales Co., low bidder.

South Fork, Cal., 300 tons, highway bridge.

Alder Point, Cal., 300 tons, bridge.

Willits, Cal., 275 tons, highway bridge.

Dunaway, Ore., 1330 tons, bridge and syphon for Bureau of Reclamation.

FABRICATED PLATE

AWARDS

Norristown, Pa., 630 tons, brewery tanks, to McCarter Iron Works, Inc.

Baltimore, 259 tons, sludge tank for Back River sewage plant, to Dietrich Brothers.

Inglewood, Cal., 110 tons, 24-in. pipe line, to Western Pipe & Steel Co.

Pig Iron Output Up 5 Per Cent in December

PRODUCTION of coke pig iron in December totaled 1,177,484 gross tons against 1,085,239 tons in November. The December daily rate, at 37,983 tons, represented a gain of five per cent over the November average of 36,174 tons a day. With returns in from all but two active furnaces, there was a loss of one stack, 75 being in blast on Jan. 1, against 76 on Dec. 1.

Production for the past year amounted to 13,208,190 gross tons, compared with 8,686,443 tons for 1932.

(The usual tabulations and revised production figures will appear next week.)

Standards for Electric Welding Apparatus

NATIONAL standards covering electrical apparatus for arc and resistance welding, the first in the field of electric welding, have been approved by the American Standards Association. They are intended to assure adequate and properly controlled supply of electric current to meet the exacting requirements of welding service, and cover generators, transformers, and other equipment. The sectional committee, organized in 1931 under the joint sponsorship of the American Institute of Electrical Engineers and the National Electrical Manufacturers Association, consists of five producers, six consumers and eight general interests.

Howland Succeeds Mills As Illinois Sales Head

EDWIN S. MILLS has resigned as vice-president and general manager of sales, Illinois Steel Co., Chicago, and has been succeeded by William I. Howland, Jr., who has been assistant general manager of sales, in charge of bars, strip and alloy metal.

Railroad Equipment

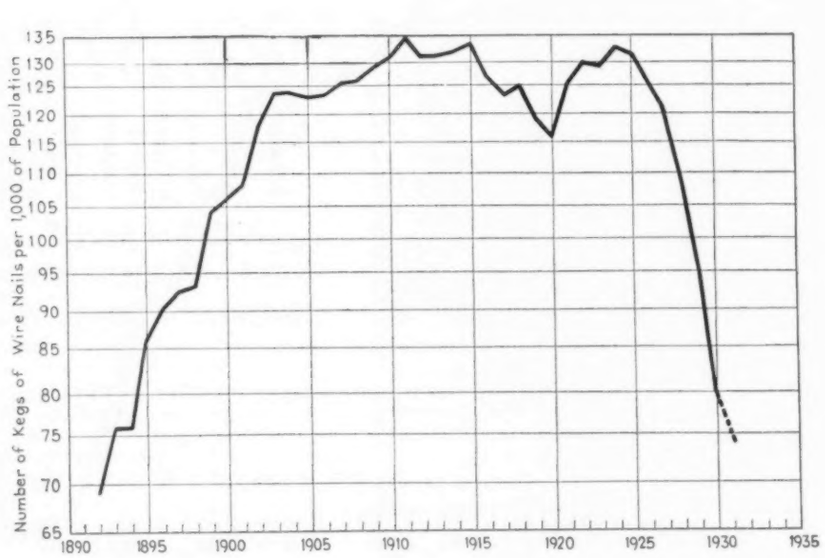
Pennsylvania Salt Mfg. Co. has ordered two tank cars from American Car & Foundry Co.

American Tank Line has bought 10 tank cars from American Car & Foundry Co.

Chilean State Railways are inquiring for 20 first-class passenger coaches.

Norfolk & Western is inquiring for 10 coaches and eight combination passenger and baggage cars.

ROY E. HOFFMANN has been placed in charge of sales of Superior Diesel engines and Superior natural gas engines in the Southeastern territory with headquarters at Jacksonville, Fla. Mr. Hoffmann is a native of Georgia, and his long experience selling Diesel engines has given him an extensive acquaintance in the Carolinas, Georgia and Florida, in which territory he will travel for the National-Superior Co. He was previously manager of Diesel engine sales for Fairbanks-Morse Co., Atlanta..



Forty Years of Wire Nail Consumption

DEPRESSION years show a drastic reduction in the consumption of wire nails, but the consumption statistics (production less exports) indicate a steady falling off since 1924. The curve is a moving five-year average of use per 1000 of population. The peak, in 1911, was of the order of 134.8 kegs per 1000 population. It was again nearly reached in 1924, at 133.2 kegs. In 1923, consumption topped 150 kegs per 1000, but the five-year average at that time was 129 kegs. In 1932, when takings were lower than for any single year since 1893, or 40 years, consumption was 41½ kegs per 1000 population.

Statistical Record of Iron and Steel

Monthly Average Prices Computed from the Weekly Market Quotations of THE IRON AGE

Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnace and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia. Quoted in gross tons

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$28.88	$33.21	$31.36	$39.39	$31.18	$18.48	$26.78	$22.15	$22.44	$21.79	$19.44	$17.63	$18.43	$18.19	$15.90	$14.68	$13.56
Feb.	29.75	33.21	31.36	42.35	28.45	18.14	27.20	22.84	22.50	21.77	19.07	17.73	18.38	18.02	15.80	14.51	13.56
March	32.18	33.21	30.10	42.24	25.18	18.35	30.11	22.81	21.99	21.65	19.03	17.73	18.36	17.75	15.71	14.45	13.56
April	38.56	32.71	27.11	43.01	23.73	20.00	30.83	22.31	20.95	20.96	19.21	17.67	18.52	17.73	15.79	14.35	13.76
May	41.87	32.71	26.91	43.64	22.78	23.35	29.74	21.40	19.85	20.69	19.09	17.45	18.70	17.60	15.76	14.12	14.48
June	47.95	32.71	26.46	44.09	21.73	23.95	28.23	20.27	19.22	20.00	18.92	17.23	18.65	17.48	15.62	14.01	15.01
July	52.11	32.73	26.37	45.44	20.22	23.86	25.96	19.31	18.96	19.51	18.56	17.10	18.48	17.16	15.56	13.76	15.50
Aug.	51.43	32.73	26.83	47.38	18.97	26.69	25.19	19.40	19.01	19.46	18.17	17.11	18.39	16.90	15.51	13.69	16.09
Sept.	46.93	32.73	27.11	47.83	19.89	31.78	25.02	19.46	19.39	19.46	18.03	17.54	18.27	16.70	15.44	13.64	16.71
Oct.	33.21	34.31	27.52	45.05	19.97	30.57	23.30	19.46	19.92	19.69	17.96	17.94	18.33	16.31	15.21	13.63	16.61
Nov.	33.21	34.36	30.34	38.65	19.79	27.82	21.40	19.79	21.16	20.13	17.59	18.46	18.36	16.21	14.97	13.59	16.61
Dec.	33.21	34.26	36.13	34.51	19.11	25.70	21.88	21.60	21.54	19.94	17.55	18.51	18.24	15.95	14.86	13.56	16.90
Aver.	*36.11*	*33.24*	*28.97*	*42.76*	*22.58*	*24.06*	*26.30*	*20.90*	*20.58*	*20.42*	*18.55*	*17.68*	*18.43*	*17.17*	*15.51*	*14.00*	*15.20*

Basic Pig Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$30.00	$33.00	$30.00	$37.40	$30.00	$18.15	$25.80	$21.25	$22.00	$20.00	$18.00	$17.00	$17.50	$18.50	$17.00	$15.00	$13.50
Feb.	30.00	33.00	30.00	42.25	27.50	17.75	26.25	22.00	22.00	20.00	18.00	17.00	17.50	18.50	16.75	14.62	13.50
March	32.25	33.00	28.94	41.50	24.20	17.94	30.13	21.94	21.30	20.00	18.40	17.00	17.50	18.50	16.50	14.50	13.50
April	38.75	32.00	25.75	42.40	22.88	20.00	31.05	21.55	20.13	18.63	19.00	16.88	17.90	18.50	16.50	14.50	13.50
May	41.60	32.00	25.75	43.25	22.00	24.60	29.00	20.50	18.81	18.38	18.20	16.30	18.38	18.50	16.25	14.20	14.20
June	48.75	32.00	25.75	44.00	20.75	25.00	27.38	19.63	18.05	18.00	17.88	15.45	18.50	18.50	15.50	14.00	15.00
July	52.50	32.00	25.75	45.85	19.38	24.25	25.10	19.00	18.00	17.63	17.50	16.00	18.50	18.10	15.50	13.50	15.50
Aug.	51.20	32.00	25.75	48.10	18.20	26.60	24.75	19.00	18.00	17.50	17.30	16.00	18.50	18.00	15.50	13.50	16.20
Sept.	42.75	32.00	25.75	48.50	19.13	32.63	24.88	19.00	18.30	17.50	17.06	16.19	18.50	17.60	15.50	13.50	17.00
Oct.	33.00	33.00	25.75	43.75	19.19	30.90	23.50	19.00	18.63	18.00	17.00	17.10	18.50	17.00	15.25	13.50	17.00
Nov.	33.00	33.00	28.31	36.50	19.00	27.75	20.88	19.13	19.88	18.50	17.00	17.50	18.50	17.00	15.00	13.50	17.00
Dec.	33.00	33.00	34.25	33.00	18.63	24.81	21.00	20.90	20.00	18.50	17.00	17.50	18.50	17.00	15.00	13.50	17.00
Aver.	*38.90*	*32.50*	*27.65*	*42.21*	*21.74*	*24.20*	*25.81*	*20.24*	*19.59*	*18.55*	*17.70*	*16.66*	*18.19*	*17.98*	*15.85*	*13.98*	*15.24*

Bessemer Pig Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$38.60	$32.00	$19.60	$27.50	$23.00	$22.88	$21.00	$19.50	$17.50	$18.25	$19.00	$17.50	$16.00	$15.00
Feb.	41.50	29.00	19.50	28.06	23.50	22.75	21.00	19.00	17.50	18.25	19.00	17.25	15.62	15.00
March	42.00	26.20	19.50	30.25	23.38	22.30	21.00	19.40	17.50	18.38	19.00	17.00	15.50	15.00
April	42.20	25.00	20.63	31.00	22.80	21.13	19.63	19.50	17.50	18.50	19.00	17.00	15.50	15.00
May	42.63	24.20	24.40	30.10	22.13	20.00	19.38	19.20	17.30	19.00	19.00	17.00	15.20	15.20
June	43.00	22.75	25.00	28.50	21.13	19.00	19.00	18.88	17.00	19.00	19.00	17.00	15.00	16.00
July	45.60	20.88	25.00	26.70	20.20	19.06	18.63	18.50	17.00	19.00	18.60	17.00	15.00	16.50
Aug.	47.39	20.00	28.20	26.50	20.00	19.00	18.00	18.40	17.00	19.00	18.50	17.00	15.00	17.20
Sept.	48.50	20.00	33.50	26.50	20.00	19.30	18.25	18.00	17.19	19.00	18.30	17.00	15.00	18.00
Oct.	47.25	20.00	33.40	25.20	20.00	19.63	19.13	18.00	17.55	19.00	17.75	16.88	15.00	18.00
Nov.	40.25	20.00	31.75	23.25	20.38	20.88	19.30	18.00	18.19	19.00	17.50	16.50	15.00	18.00
Dec.	35.00	20.00	28.13	22.88	21.00	21.00	19.88	17.56	18.25	19.00	17.50	16.20	15.00	18.00
Aver.	*42.82*	*23.34*	*25.63*	*27.20*	*21.53*	*20.57*	*19.57*	*18.66*	*17.46*	*18.78*	*18.51*	*16.94*	*15.23*	*16.41*

No. 2 Foundry Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$31.00	$33.00	$31.00	$39.40	$31.88	$19.30	$27.00	$22.50	$22.38	$20.50	$18.50	$17.25	$17.50	$18.50	$17.00	$15.50	$14.50
Feb.	32.00	33.00	31.00	41.50	28.00	18.88	27.50	23.00	22.00	20.50	18.50	17.25	17.50	18.50	16.75	15.12	14.50
March	34.75	33.00	29.94	41.25	25.90	19.00	30.50	23.00	21.10	20.50	18.50	17.25	17.75	18.50	16.50	15.00	14.50
April	39.75	33.00	26.75	42.80	24.75	20.75	31.00	21.80	20.13	19.00	18.50	17.25	18.00	18.50	17.00	15.00	14.50
May	42.40	33.00	26.75	44.25	23.50	23.80	30.20	20.75	19.13	18.88	18.50	17.20	18.50	18.50	17.00	14.70	14.70
June	50.25	33.00	26.75	45.00	22.10	24.00	27.63	19.63	18.30	17.96	18.13	16.75	18.50	18.50	17.00	14.50	15.50
July	54.50	33.00	26.75	45.00	20.13	24.25	25.50	19.00	18.50	17.69	18.00	16.65	18.50	18.10	17.00	14.50	16.00
Aug.	53.20	33.00	26.75	47.00	19.63	32.60	24.88	19.13	18.50	17.50	17.60	16.50	18.50	18.00	17.00	14.50	16.70
Sept.	47.00	33.00	26.75	49.40	21.00	34.88	24.75	19.80	18.80	17.63	17.50	16.88	18.50	17.80	17.00	14.50	17.50
Oct.	33.00	34.00	26.75	46.50	21.00	31.80	23.60	19.50	19.13	18.50	17.50	17.10	18.50	17.13	16.63	14.50	17.50
Nov.	33.00	34.00	31.50	40.25	20.75	27.88	21.88	19.50	20.39	19.00	17.45	17.63	18.50	17.00	16.00	14.50	17.50
Dec.	33.00	34.00	36.75	36.20	20.00	25.63	22.00	21.20	20.50	18.80	17.25	17.70	18.50	17.00	15.70	14.50	17.50
Aver.	*40.32*	*33.25*	*28.95*	*43.21*	*23.22*	*25.23*	*26.37*	*20.73*	*19.90*	*18.87*	*18.00*	*17.12*	*18.23*	*18.00*	*16.72*	*14.73*	*15.91*

Malleable Pig Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$39.25	$32.00	$19.50	$27.00	$22.39	$22.39	$20.50	$18.50	$17.30	$18.00	$19.00	$17.50	$16.00	$14.50
Feb.	42.75	28.75	19.00	27.63	23.00	22.00	20.50	18.50	17.25	18.00	19.00	17.25	15.62	14.50
March	42.40	25.80	19.00	30.50	22.50	21.50	20.50	18.50	17.25	18.25	19.00	17.00	15.50	14.50
April	43.25	25.00	19.50	31.00	22.10	20.63	19.00	18.50	17.25	18.50	19.00	17.00	15.50	14.50
May	43.88	24.10	24.20	30.20	21.00	19.25	18.88	18.50	17.25	19.00	19.00	17.00	15.20	14.70
June	44.20	22.75	24.50	28.13	19.88	18.50	18.05	18.13	17.00	19.00	19.00	17.00	15.00	15.50
July	45.00	20.88	25.13	25.40	19.00	18.50	17.75	18.00	17.00	19.00	18.60	17.00	14.50	16.00
Aug.	48.40	20.00	29.50	24.50	19.13	18.50	17.50	17.60	17.00	19.00	18.50	17.00	14.50	16.70
Sept.	50.00	20.13	33.50	24.50	19.80	18.80	17.63	17.50	17.19	19.00	18.30	17.00	14.50	17.50
Oct.	49.00	20.50	32.70	23.30	19.50	19.13	18.50	17.50	17.55	19.00	17.75	16.88	14.50	17.50
Nov.	39.30	20.20	29.00	20.88	19.75	20.38	19.00	17.50	18.19	19.00	17.50	16.50	14.50	17.50
Dec.	35.00	20.00	26.25	20.00	21.20	20.50	18.75	17.50	18.15	19.00	17.50	16.20	14.50	17.50
Aver.	*43.53*	*23.34*	*25.15*	*26.09*	*20.77*	*20.01*	*18.88*	*18.02*	*17.37*	*18.73*	*18.51*	*16.94*	*14.98*	*15.91*

No. 2 Foundry Pig Iron at Chicago Furnace, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$30.00	$33.00	$31.00	$40.00	$31.50	$18.90	$28.90	$23.70	$24.00	$23.00	$20.88	$18.50	$20.00	$20.00	$17.50	$16.50	$15.50
Feb.	32.00	33.00	31.00	42.25	29.00	19.00	29.75	24.50	24.00	23.00	20.25	18.50	20.00	20.00	17.50	16.50	15.50
March	36.00	33.00	29.94	43.00	25.60	20.00	31.25	24.38	23.80	23.00	20.00	18.50	20.00	19.50	17.50	16.50	15.50
April	39.25	33.00	26.75	43.00	24.00	20.50	32.00	24.10	22.50	22.00	20.00	18.50	20.00	19.40	17.50	16.00	15.50
May	43.80	33.00	26.75	43.06	22.80	22.60	32.00	22.75	21.13	21.63	20.00	18.20	20.00	19.00	17.50	16.00	15.80
June	51.00	33.00	26.75	43.40	20.75	23.25	31.25	21.25	20.30	21.10	20.00	18.00	20.00	18.39	17.50	16.00	16.00
July	55.00	33.00	26.75	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60	20.00	17.90	17.50	15.50	16.78
Aug.	55.00	33.00	26.75	46.00	19.55	28.60	27.00	20.38	20.50	21.00	19.50	17.63	20.00	17.50	17.50	15.50	17.10
Sept.	54.67	33.00	26.75	46.00	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25	20.00	17.50	17.50	15.50	17.50
Oct.	33.00	34.00	27.75	44.50	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80	20.00	17.50	17.00	15.50	17.50
Nov.	33.00	34.00	31.00	39.40	20.60	29.75	23.13	21.00	22.75	21.00	18.50	20.00	20.00	17.50	17.00	15.50	17.50
Dec.	33.00	34.00	38.75	34.50	19.63	28.00	23.00	22.50	23.00	21.00	18.50	20.00	20.00	17.50	16.70	15.50	17.50
Aver.	*41.31*	*33.25*	*29.16*	*42.53*	*22.93*	*24.85*	*28.16*	*22.10*	*22.09*	*21.64*	*19.68*	*18.54*	*20.00*	*18.47*	*17.35*	*15.87*	*16.47*

Malleable Pig Iron at Chicago Furnace, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$30.94	$33.50	$31.50	$40.50	$32.00	$18.90	$28.90	$23.88	$24.00	$23.00	$20.88	$18.50	$20.00	$20.00	$17.50	$16.50	$15.50
Feb.	31.75	33.50	31.50	42.75	29.38	19.13	29.75	24.50	24.00	23.00	20.25	18.50	20.00	20.00	17.50	16.50	15.50
March	35.40	33.50	30.44	43.50	25.80	20.00	31.25	24.38	24.00	23.00	20.00	18.50	20.00	19.50	17.50	16.50	15.50
April	39.00	33.50	27.25	43.50	24.00	20.50	32.00	24.10	22.63	22.00	20.00	18.50	20.00	19.40	17.50	16.00	15.50
May	43.60	33.50	27.25	43.50	23.00	22.60	32.00	22.75	21.25	21.42	20.00	18.22	20.00	19.00	17.50	16.00	15.80
June	50.25	33.50	27.25	43.50	21.50	23.25	31.25	21.25	20.60	21.10	20.00	18.00	20.00	18.50	17.50	16.00	16.00
July	55.00	33.50	27.25	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60	20.00	17.90	17.50	15.50	16.78
Aug.	55.00	33.50	27.25	46.50	19.60	28.60	27.00	20.38	20.50	21.00	19.50	17.63	20.00	17.50	17.50	15.50	17.10
Sept.	54.75	33.50	27.25	46.50	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25	20.00	17.50	17.50	15.50	17.50
Oct.	33.50	34.50	28.25	45.75	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80	20.00	17.50	17.10	15.50	17.50
Nov.	33.50	34.50	31.50	39.90	20.60	29.75	23.13	20.88	22.75	21.00	18.50	20.00	20.00	17.50	17.00	15.50	17.50
Dec.	33.50	34.50	39.50	35.00	19.63	28.00	23.00	22.62	23.00	21.00	18.50	20.00	20.00	17.50	16.70	15.50	17.50
Aver.	*41.35*	*33.75*	*29.68*	*43.01*	*23.11*	*24.87*	*28.16*	*22.11*	*22.15*	*21.63*	*19.68*	*18.54*	*20.00*	*18.48*	*17.36*	*15.87*	*16.47*

Lake Superior Charcoal Pig Iron at Chicago, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$31.75	$37.50	$38.85	$48.75	$42.50	$31.10	$33.15	$29.15	$29.04	$29.04	$27.04	$27.04	$27.04	$27.04	$27.04	$23.17	$23.17
Feb.	33.75	37.50	38.85	58.38	39.50	29.38	33.90	29.15	29.04	29.04	27.04	27.04	27.04	27.04	27.04	23.17	23.17
March	36.75	37.50	38.85	58.20	38.50	26.00	35.40	29.15	29.04	29.04	27.04	27.04	27.04	25.04	26.24	23.17	23.17
April	40.25	37.50	31.75	57.25	38.50	26.50	36.53	29.15	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17
May	48.15	37.50	31.75	57.50	37.50	28.40	36.65	29.15	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17
June	52.88	37.62	31.75	57.50	37.50	29.75	36.65	29.12	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17
July	57.75	38.00	31.75	57.50	36.37	31.65	34.81	29.04	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17
Aug.	58.00	38.00	32.25	57.70	33.60	34.05	32.04	29.04	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17
Sept.	58.00	38.00	32.75	58.50	33.00	36.15	32.04	29.04	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.67
Oct.	37.50	38.00	33.44	58.50	31.50	36.15	29.86	29.04	29.04	27.54	27.04	27.04	27.04	27.04	25.04	23.17	23.54
Nov.	37.50	38.70	38.50	55.75	31.50	36.15	28.40	29.04	29.04	27.54	27.04	27.04	27.04	27.04	25.04	23.17	23.54
Dec	37.50	38.70	43.00	49.13	31.50	34.65	29.15	29.04	29.04	27.04	27.04	27.04	27.04	27.04	23.04	23.17	23.54
Aver.	*44.15*	*37.88*	*35.29*	*56.22*	*35.96*	*31.66*	*33.22*	*29.09*	*29.04*	*28.58*	*27.04*	*27.04*	*27.04*	*26.87*	*25.31*	*23.17*	*23.30*

Southern No. 2 Foundry Pig Iron at Birmingham, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$23.20	$33.00	$31.00	$38.75	$32.25	$16.20	$23.25	$21.50	$20.00	$22.00	$18.50	$16.00	$16.50	$14.50	$13.80	$11.50	$11.00
Feb.	24.63	33.00	31.00	40.00	28.13	15.00	24.38	22.50	20.00	22.00	18.00	16.00	16.50	14.63	12.88	11.00	11.00
March	29.00	33.00	29.44	40.00	25.30	15.00	26.40	22.50	20.00	22.00	18.00	16.00	16.00	14.50	12.38	11.00	11.00
April	34.50	33.00	26.75	40.50	23.50	15.88	27.00	22.30	20.00	22.00	18.00	16.00	15.40	14.00	12.00	11.00	11.25
May	39.00	33.00	26.75	42.00	22.20	17.60	26.85	21.50	20.00	22.00	18.00	15.70	15.00	14.00	12.00	11.00	12.00
June	42.25	33.00	25.25	42.00	21.88	18.38	25.75	20.00	19.60	21.20	18.00	15.88	15.00	14.00	12.00	11.00	12.00
July	47.00	33.00	25.15	42.00	20.25	18.25	25.00	18.00	18.00	21.00	17.44	15.50	14.63	14.00	12.00	11.00	12.50
Aug.	47.00	33.00	27.38	42.00	19.00	20.10	23.70	17.50	18.00	21.00	17.25	15.69	14.50	14.00	12.00	11.00	13.10
Sept.	47.00	33.00	27.95	42.00	19.00	26.00	22.75	17.50	18.50	20.75	17.25	16.25	14.50	14.00	12.00	11.00	13.50
Oct.	33.00	34.00	28.00	42.00	19.00	26.80	20.63	17.50	19.38	20.00	17.25	16.25	14.50	14.00	12.00	11.00	13.50
Nov.	33.00	34.00	30.75	38.00	18.40	23.50	19.60	17.75	21.00	20.00	16.00	16.39	14.50	14.00	12.00	11.00	13.50
Dec.	33.00	33.40	35.20	38.00	17.33	22.88	21.00	19.80	22.00	20.00	16.00	16.50	14.50	14.00	12.00	11.00	13.50
Aver.	*36.05*	*33.20*	*28.72*	*40.60*	*22.19*	*19.63*	*23.86*	*19.86*	*19.71*	*21.16*	*17.47*	*16.01*	*15.13*	*14.14*	*12.27*	*11.04*	*12.32*

Southern No. 2 Foundry Pig Iron at Cincinnati, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$26.10	$35.90	$34.60	$41.80	$36.75	$20.70	$27.45	$25.55	$24.05	$25.69	$22.19	$19.69	$20.19	$17.69	$14.19	$14.07	$13.82
Feb.	27.53	35.90	34.60	43.60	32.63	20.00	28.68	26.55	24.05	25.69	21.69	19.69	20.19	17.19	14.19	13.82	13.82
March	31.90	35.90	33.54	43.60	29.80	19.50	30.80	26.55	24.05	25.69	21.69	19.69	19.69	16.69	14.19	13.82	13.82
April	37.40	35.90	30.65	44.00	28.00	20.38	31.05	26.35	24.05	25.69	21.69	19.69	19.09	16.69	14.19	13.82	14.32
May	41.90	35.90	29.85	45.60	26.70	22.10	30.75	25.55	24.05	25.69	21.69	19.39	18.69	16.69	14.69	13.82	15.96
June	45.15	36.08	28.39	45.60	26.38	23.00	29.30	24.05	23.25	24.59	21.69	19.56	18.69	16.69	14.69	13.82	16.51
July	49.90	36.60	28.35	45.60	24.75	22.30	28.85	22.05	22.18	24.19	21.13	19.19	17.99	16.39	14.69	13.82	17.01
Aug.	49.90	36.60	30.40	45.78	23.50	24.35	27.68	21.55	22.55	24.19	20.94	19.39	17.57	15.82	14.69	13.82	17.83
Sept.	49.90	36.60	31.25	46.50	23.50	29.55	26.55	21.55	22.85	24.07	20.94	19.94	17.19	15.49	14.69	13.82	18.23
Oct.	49.38	37.60	31.60	46.50	23.50	30.85	24.68	21.55	23.43	23.69	20.94	19.94	17.30	15.19	14.69	13.82	18.13
Nov.	35.90	37.60	34.35	42.50	22.90	27.55	23.65	21.80	24.87	23.69	19.69	20.07	17.69	14.94	14.69	13.82	18.13
Dec.	35.90	37.60	38.60	42.50	21.75	26.93	25.05	23.85	25.49	23.69	19.69	20.19	17.69	14.39	14.69	13.82	18.13
Aver.	*40.07*	*36.52*	*32.16*	*44.47*	*26.68*	*23.93*	*27.87*	*23.91*	*23.74*	*24.71*	*21.16*	*19.70*	*18.51*	*16.16*	*14.52*	*13.84*	*16.31*

Eastern Pennsylvania No. 2X Foundry Pig Iron at Philadelphia, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$30.10	$34.25	$36.15	$44.10	$33.34	$21.34	$29.76	$24.11	$25.01	$24.26	$22.76	$20.56	$21.76	$21.26	$18.26	$16.14	$13.84
Feb.	31.88	34.25	36.15	45.10	31.09	21.09	30.01	24.04	25.01	24.14	22.26	21.14	21.76	21.26	18.26	16.14	13.34
March	37.31	34.25	34.39	45.53	27.59	21.26	32.30	24.16	24.21	23.36	22.26	21.26	21.89	20.76	18.26	16.12	13.84
April	41.38	34.25	31.90	46.85	26.26	23.62	32.95	23.06	22.82	23.26	22.26	21.26	22.26	20.76	18.26	16.09	14.59
May	43.60	34.25	30.70	47.10	25.71	26.09	32.76	22.67	21.51	22.89	22.26	21.26	22.26	20.39	17.76	15.34	15.99
June	48.19	34.29	29.50	47.15	25.50	27.06	30.76	21.85	21.26	22.66	22.14	21.26	22.26	20.26	17.71	15.34	16.84
July	53.13	34.40	29.08	48.15	23.55	27.92	27.68	21.26	21.26	22.26	21.51	20.86	22.16	19.96	17.51	14.84	17.22
Aug.	53.00	34.40	29.60	51.96	20.64	32.26	25.89	21.51	21.57	22.26	21.26	20.76	21.76	19.76	17.32	14.54	17.79
Sept.	51.67	34.40	30.70	53.51	21.22	34.83	26.26	21.76	21.96	22.26	20.76	21.01	21.76	19.56	16.86	14.34	18.59
Oct.	34.25	38.85	32.10	52.53	22.23	32.54	24.04	21.76	22.64	22.26	20.51	21.26	21.76	19.26	16.64	14.28	18.51
Nov.	34.25	39.15	35.35	44.99	22.74	30.39	23.01	22.64	23.64	23.56	20.26	21.64	21.76	19.01	16.07	14.09	18.51
Dec.	34.25	39.15	40.10	35.54	21.82	28.86	24.26	24.56	24.26	23.39	20.26	21.76	21.46	18.26	16.01	13.84	19.51
Aver.	*41.08*	*35.49*	*32.98*	*46.88*	*25.14*	*27.27*	*28.31*	*22.78*	*22.93*	*23.05*	*21.55*	*21.17*	*21.90*	*20.04*	*17.41*	*15.09*	*16.55*

Basic Pig Iron, Delivered Eastern Pennsylvania, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$30.00	$33.75	$33.90	$39.19	$33.51	$20.18	$27.80	$23.00	$24.25	$23.00	$21.50	$19.50	$19.75	$19.50	$17.25	$16.25	$13.50
Feb.	30.50	33.75	33.90	41.90	30.65	19.84	28.19	22.69	23.88	23.00	21.19	19.50	19.88	19.44	17.25	16.25	13.50
March	33.50	33.75	32.84	44.24	26.15	22.61	29.56	21.81	23.55	22.10	20.85	19.50	20.25	19.06	17.25	16.00	13.50
April	37.50	32.75	29.65	44.80	25.00	21.00	30.81	21.50	22.31	21.75	20.75	19.50	20.25	18.90	17.13	16.00	14.09
May	39.70	32.75	29.65	44.80	25.00	24.00	30.60	21.00	21.13	21.75	20.75	19.10	20.25	18.75	17.00	16.00	15.29
June	46.00	32.79	26.54	44.66	24.63	25.00	28.14	21.00	21.50	21.45	20.75	19.00	20.25	18.75	17.00	16.00	16.09
July	50.40	32.90	26.12	43.70	22.38	25.75	26.60	20.20	21.50	21.00	20.75	18.95	20.20	18.45	16.75	15.50	16.59
Aug.	50.00	32.90	26.60	47.21	19.70	27.23	25.00	20.00	20.50	20.95	20.15	18.75	19.75	18.25	16.75	14.20	17.24
Sept.	45.44	32.90	26.60	51.26	19.19	30.83	25.00	20.00	20.70	20.75	20.00	18.88	19.75	18.15	16.75	13.50	17.84
Oct.	33.75	36.60	28.00	49.60	20.50	29.30	24.20	20.00	21.25	20.69	20.00	19.45	19.75	17.75	16.75	13.50	17.76
Nov.	33.75	36.90	30.38	41.94	20.70	27.83	22.88	21.13	22.39	22.60	19.60	19.75	19.75	17.75	16.39	13.50	17.76
Dec.	33.75	36.90	35.00	44.15	20.63	27.31	23.13	23.41	23.00	22.00	19.25	20.05	19.55	17.75	16.25	13.50	18.76
Aver.	*38.69*	*34.05*	*29.93*	*44.79*	*24.00*	*25.08*	*26.83*	*21.31*	*22.16*	*21.75*	*20.46*	*19.33*	*19.95*	*18.54*	*16.87*	*15.02*	*15.99*

No. 2 Foundry Pig Iron at Cleveland Furnace, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$31.10	$33.30	$31.40	$40.00	$33.40	$20.06	$27.37	$23.20	$23.37	$21.82	$19.00	$18.00	$19.00	$19.00	$17.50	$16.00	$15.00
Feb.	32.93	33.30	31.40	41.90	30.22	20.06	28.50	24.00	23.49	21.88	18.63	18.00	19.00	19.00	17.50	16.00	15.00
March	37.06	33.30	30.58	43.15	27.80	21.55	31.65	24.00	23.97	21.31	19.40	18.00	19.00	19.00	17.20	15.70	15.00
April	40.27	33.30	27.15	43.40	26.62	20.81	32.02	23.75	22.32	20.35	19.37	18.00	19.00	18.88	17.00	15.50	15.00
May	42.90	33.30	27.15	44.53	25.50	23.75	31.71	22.75	20.37	19.50	19.00	18.00	19.00	18.50	17.00	15.50	15.30
June	50.63	33.32	27.15	44.90	24.00	24.06	29.96	21.00	19.62	19.19	18.70	17.88	19.00	18.50	17.00	15.50	15.50
July	55.80	33.40	27.15	45.20	21.31	24.75	26.94	19.75	19.50	19.00	18.50	17.50	19.00	18.00	17.00	15.50	16.00
Aug.	55.17	33.40	27.40	48.06	20.50	31.31	25.90	20.06	19.50	19.00	18.50	17.50	19.00	18.00	17.00	15.50	16.70
Sept.	53.15	33.40	27.65	49.86	20.75	35.94	25.37	20.31	19.50	19.00	18.50	17.88	19.00	17.60	17.00	15.00	17.50
Oct.	33.30	34.40	28.15	47.88	20.75	33.59	24.75	20.50	20.05	19.37	18.38	18.13	19.00	17.50	17.00	15.00	17.50
Nov.	33.30	34.40	31.90	43.46	20.56	29.97	22.85	20.81	21.82	20.10	18.00	19.00	19.00	17.50	17.00	15.00	17.50
Dec.	33.30	34.40	36.90	36.32	19.95	26.85	22.56	21.88	21.76	19.88	18.00	19.00	19.00	17.50	16.60	15.00	17.50
Aver.	*41.58*	*33.60*	*29.67*	*44.06*	*24.28*	*26.05*	*27.47*	*21.84*	*21.19*	*20.03*	*18.67*	*18.16*	*19.00*	*18.25*	*17.07*	*15.43*	*16.13*

No. 2 Foundry Pig Iron at Buffalo Furnace, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$34.94	$33.00	$31.00	$40.90	$32.38	$19.44	$26.94	$22.25	$23.00	$21.00	$18.50	$17.00	$18.00	$18.75	$17.50	$16.00	$16.00
Feb.	35.25	33.00	31.00	42.00	30.50	18.87	27.56	22.25	22.75	21.00	17.39	17.00	18.39	18.50	17.50	16.00	16.00
March	38.45	33.00	29.94	44.75	29.00	18.30	29.05	21.81	22.12	21.00	17.05	17.00	18.50	18.50	17.50	16.00	16.00
April	42.62	33.00	26.75	45.00	26.15	20.81	29.56	21.37	20.65	21.00	17.50	17.00	18.50	18.50	17.50	16.00	16.00
May	44.95	33.00	26.75	45.00	25.62	22.62	29.40	20.25	19.00	20.75	17.50	17.00	18.50	18.50	17.13	16.00	16.00
June	48.31	33.00	26.75	44.75	23.42	23.05	29.06	19.37	19.00	19.60	17.39	17.00	18.75	18.50	17.00	16.00	16.00
July	52.25	33.00	26.63	45.00	20.87	24.50	26.00	19.00	18.85	19.00	16.94	17.00	19.50	18.50	17.00	16.00	16.50
Aug.	53.00	33.00	27.77	47.75	19.50	30.70	24.95	19.19	18.72	19.00	16.20	17.00	19.50	18.50	17.00	16.00	17.10
Sept.	53.00	33.00	28.25	50.10	20.00	33.94	24.87	19.37	18.75	19.00	16.25	17.00	19.50	18.50	17.00	16.00	17.50
Oct.	33.00	34.00	28.70	47.44	20.37	31.12	23.06	19.05	19.40	19.00	16.88	17.10	19.50	17.75	17.00	16.00	17.50
Nov.	33.00	34.00	34.30	42.56	19.12	27.80	20.87	20.50	21.19	19.00	17.00	17.88	19.50	17.50	17.00	16.00	17.50
Dec.	33.00	34.00	38.25	36.60	19.30	25.50	21.56	22.62	21.50	19.00	17.00	18.00	19.50	17.50	16.80	16.00	17.50
Aver.	*41.81*	*33.25*	*29.67*	*44.32*	*23.85*	*24.72*	*26.07*	*20.59*	*20.41*	*19.86*	*17.13*	*17.17*	*18.97*	*18.29*	*17.16*	*16.00*	*16.63*

No. 2 Foundry Pig Iron at St. Louis, Gross Ton

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$31.61	$25.68	$25.06	$24.56	$22.31	$20.56	$20.75	$20.50	$18.25	$18.33	$18.33
Feb.	31.81	26.56	26.06	24.56	22.06	20.56	20.75	20.50	18.25	18.33	18.33
March	33.43	26.56	26.06	24.56	21.86	20.56	20.75	20.44	18.25	18.33	18.33
April	34.31	26.56	24.37	24.00	21.56	20.56	20.75	20.25	18.25	18.33	17.34
May	34.31	24.31	22.50	23.56	21.56	19.81	20.75	19.75	18.25	18.33	16.55
June	33.56	23.68	21.56	23.16	21.31	19.81	20.75	19.75	18.25	18.33	16.85
July	30.15	22.01	21.56	23.06	21.06	19.76	20.75	19.10	18.25	18.33	17.35
Aug.	29.06	22.12	21.81	23.06	20.56	19.68	20.69	19.00	18.25	18.33	17.85
Sept.	29.31	22.46	22.96	23.06	20.56	20.31	20.50	18.70	18.25	18.33	18.05
Oct.	27.21	22.56	23.62	22.56	20.56	20.56	20.50	18.25	18.25	18.33	18.00
Nov.	25.93	22.56	24.12	22.36	20.56	20.87	20.50	18.25	18.25	18.33	18.00
Dec.	26.61	24.26	24.56	22.56	20.56	20.81	20.50	18.25	18.25	18.33	18.00
Aver.	*30.61*	*24.11*	*23.69*	*23.42*	*21.21*	*20.33*	*20.66*	*19.39*	*18.25*	*18.33*	*17.75*

Ferroalloy Quotations

Ferromanganese (80 Per Cent), Gross Ton, at Seaboard

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$175.00	$250.00	$255.00	$146.00	$112.50	$58.35	$105.00	$108.70	$112.50	$115.00	$100.00	$100.00	$105.00	$100.00	$80.00	$75.00	$68.00
Feb.	231.25	250.00	215.00	172.50	100.00	60.42	107.50	107.50	115.00	115.00	100.00	100.00	105.00	95.50	80.00	75.00	68.00
March	290.00	250.00	175.00	216.25	96.00	62.50	113.75	107.50	115.00	97.60	100.00	100.00	105.00	94.00	80.00	75.00	68.00
April	362.50	290.00	150.00	240.00	90.00	64.37	120.00	107.50	115.00	88.00	100.00	100.00	105.00	94.00	80.00	75.00	68.00
May	420.50	290.00	138.40	250.00	85.00	66.87	128.00	107.50	115.00	88.00	94.00	103.00	105.00	94.00	80.00	75.00	68.00
June	443.75	290.00	121.00	225.00	80.00	67.50	128.75	107.50	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	68.00
July	406.25	290.00	111.00	225.00	70.60	67.50	*119.50	106.50	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00
Aug.	400.00	290.00	101.25	198.75	70.00	67.50	117.50	95.75	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00
Sept.	387.50	285.00	98.75	170.00	65.80	75.63	*111.25	90.00	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00
Oct.	310.00	285.00	105.00	170.00	63.00	100.00	*110.00	90.00	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00
Nov.	256.00	285.00	112.50	170.00	61.50	100.00	*108.75	98.75	115.00	96.60	90.00	105.00	105.00	94.00	80.00	68.00	82.00
Dec.	243.75	275.00	122.50	135.00	60.00	100.00	*108.25	107.00	115.00	100.00	100.00	105.00	105.00	82.80	73.60	68.00	82.00
Aver.	*327.21*	*277.50*	*142.12*	*193.21*	*79.53*	*74.22*	*114.85*	*102.85*	*114.79*	*95.02*	*94.50*	*103.17*	*105.00*	*93.70*	*79.47*	*70.92*	*75.00*

*Price at furnace, where lower than price at seaboard.

Spiegeleisen (19 to 21 Per Cent), Gross Ton, at Furnace

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$60.00	$60.00	$66.00	$51.40	$45.00	$26.00*	$34.40	$38.00	$33.00	$32.00	$37.00	$30.80	$31.00	$31.00	$28.00	$26.00	$24.00
Feb.	68.75	61.25	60.75	58.75	40.00	38.00	35.50	38.00	33.00	32.00	37.00	31.00	31.00	31.00	28.00	26.00	24.00
March	75.00	71.25	47.00	60.00	35.00	29.40	40.00	38.00	33.00	32.00	37.00	31.00	31.00	31.00	28.00	26.00	24.00
April	75.00	80.75	45.00	67.60	34.00	32.25	45.00	36.80	33.00	32.00	37.00	31.00	31.00	31.00	28.00	26.00	24.00
May	81.00	84.00	37.40	75.00	32.00	35.00	52.50	36.00	33.00	32.00	36.25	31.00	31.00	31.00	28.00	26.00	24.00
June	82.50	89.00	31.25	75.00	32.00	36.00	48.50	35.00	32.80	32.00	35.50	31.00	31.00	31.00	28.00	25.75	24.00
July	85.00	89.00	35.00	75.00	27.00	36.00	44.00	34.20	32.00	32.00	33.50	31.00	31.00	31.00	28.00	25.00	27.00
Aug.	85.00	89.00	35.00	80.00	26.00	37.80	46.75	32.50	32.00	32.00	33.00	32.50	31.00	31.00	28.00	25.00	27.00
Sept.	82.50	83.75	35.00	82.00	26.00	38.25	43.75	31.40	31.80	32.00	33.00	33.00	31.00	31.00	28.00	25.00	27.00
Oct.	76.25	82.00	35.00	81.88	26.00	38.00	43.75	30.75	31.25	32.00	30.75	33.00	31.00	31.00	28.00	25.00	27.00
Nov.	66.00	80.25	37.00	75.62	26.00	37.50	41.25	30.25	32.00	37.40	30.00	30.00	31.00	30.50	28.00	24.40	27.00
Dec.	60.00	74.38	40.00	59.10	26.00	37.50	39.00	32.00	32.00	36.50	30.00	31.00	31.00	28.40	26.20	24.00	27.00
Aver.	*74.75*	*78.72*	*42.03*	*70.11*	*31.25*	*34.31*	*42.87*	*34.41*	*32.40*	*32.83*	*34.17*	*31.36*	*31.00*	*30.74*	*27.85*	*25.35*	*25.50*

50 Per Cent Ferrosilicon, Gross Ton, Delivered East of Mississippi River

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$80.00	$75.00	$54.00	$82.50	$75.00	$82.50	$85.00	$85.00	$83.50	$83.50	$83.50	$83.50	$77.50	$74.50
Feb.	85.00	93.00	55.00	83.75	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
March	85.00	92.40	55.00	90.00	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
April	85.00	86.25	55.00	92.50	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
May	80.00	76.40	55.00	94.50	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
June	80.00	69.75	55.00	90.00	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
July	80.00	66.00	55.00	82.50	71.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
Aug.	75.00	60.80	55.00	82.50	71.25	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
Sept.	75.00	60.00	55.00	82.50	72.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
Oct.	75.00	58.50	67.00	81.00	71.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
Nov.	75.00	55.80	75.00	80.63	70.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50
Dec.	75.00	56.00	82.50	76.25	75.00	82.50	85.00	83.50	83.50	83.50	83.50	83.50	77.50	74.50
Aver.	*79.17*	*70.83*	*59.88*	*84.89*	*73.35*	*82.50*	*85.00*	*84.88*	*83.50*	*83.50*	*83.50*	*83.50*	*77.50*	*74.50*

Connellsville Coke Prices

Prompt Connellsville Furnace Coke, Net Ton at Oven

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1931	1933
Jan.	$1.85	$1.50	$2.94	$9.50	$6.00	$5.65	$6.00	$5.06	$2.75	$8.05	$3.94	$3.94	$7.19	$3.50	$2.70	$2.75	$2.55	$2.50	$2.25	$1.75
Feb.	1.85	1.50	3.38	9.62	6.00	4.44	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38	2.68	2.90	2.60	2.50	2.25	1.75
March	1.90	1.50	3.47	9.60	6.00	4.06	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35	2.60	2.98	2.60	2.50	2.25	1.75
April	1.86	1.50	2.41	7.38	6.00	2.65	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20	2.60	2.78	2.60	2.50	2.25	1.75
May	1.77	1.50	2.30	7.80	6.00	3.69	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94	2.60	2.75	2.53	2.45	2.20	1.75
June	1.75	1.56	2.49	11.25	6.00	4.00	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93	2.60	2.75	2.50	2.40	2.00	1.81
July	1.75	1.64	2.75	12.75	6.00	4.07	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00	2.63	2.75	2.50	2.40	2.00	2.31
Aug.	1.70	1.50	2.80	13.60	6.00	4.31	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00	2.75	2.73	2.58	2.40	2.00	2.55
Sept.	1.65	1.61	2.94	11.12	6.00	4.56	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85	2.75	2.65	2.60	2.40	2.00	2.50
Oct.	1.60	2.03	4.88	6.00	6.00	4.52	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85	2.83	2.65	2.60	1.40	1.81	3.50
Nov.	1.52	2.28	6.90	6.00	6.00	5.87	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77	2.75	2.65	2.53	2.40	1.75	3.75
Dec.	1.50	2.64	8.38	6.00	6.00	6.12	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75	2.75	2.63	2.50	2.34	1.75	3.75
Aver.	*1.73*	*1.73*	*3.80*	*9.22*	*6.00*	*4.58*	*11.32*	*3.45*	*7.01*	*5.33*	*3.42*	*3.78*	*3.92*	*3.04*	*2.69*	*2.75*	*2.56*	*2.43*	*2.04*	*2.41*

Prompt Connellsville Foundry Coke, Net Ton at Oven

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$2.50	$2.00	$3.50	$9.75	$7.00	$6.25	$7.00	$6.38	$3.75	$8.70	$4.75	$4.88	$7.75	$4.50	$3.75	$3.75	$3.50	$3.50	$3.50	$2.50
Feb.	2.50	2.00	3.50	11.00	7.00	5.00	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31	3.75	3.75	3.50	3.50	3.50	2.50
March	2.45	2.00	3.75	11.60	7.00	4.94	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40	3.75	3.75	3.50	3.50	3.50	2.50
April	2.40	2.00	3.56	9.13	7.00	4.30	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06	3.75	3.75	3.50	3.50	3.50	2.50
May	2.40	2.00	3.25	8.90	7.00	4.31	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00	3.75	3.75	3.50	3.50	3.10	2.50
June	2.32	2.00	3.25	11.72	7.00	4.56	15.75	4.45	7.25	5.56	4.38	4.80	4.00	4.00	3.75	3.75	3.50	3.50	3.00	2.56
July	2.22	2.05	3.25	13.25	7.00	5.00	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00	3.75	3.75	3.50	3.50	3.00	2.94
Aug.	2.25	2.00	3.30	13.20	7.00	5.25	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00	3.75	3.75	3.50	3.50	2.90	3.15
Sept.	2.10	2.07	3.31	11.75	7.00	5.80	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00	3.75	3.75	3.50	3.50	2.75	3.25
Oct.	2.00	2.35	3.88	6.00	7.00	6.25	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00	3.75	3.75	3.50	3.50	2.75	4.05
Nov.	1.92	2.88	7.10	7.00	7.00	7.00	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85	3.75	3.75	3.50	3.50	2.75	4.25
Dec.	1.90	2.95	8.63	7.00	7.00	7.00	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75	3.75	3.50	3.50	3.25	2.69	4.25
Aver.	*2.25*	*2.19*	*4.19*	*10.03*	*7.00*	*5.47*	*12.27*	*4.63*	*8.00*	*6.27*	*4.42*	*4.61*	*4.96*	*4.11*	*3.75*	*3.75*	*3.50*	*3.48*	*3.08*	*3.08*

Composite Price of Finished Steel

Average of THE IRON AGE quotations on steel bars, shapes, plates, plain wire, open-hearth rails, black pipe and black sheets for period prior to 1920; hot-rolled strip added for subsequent period. Quoted in cents a pound

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	3.384	3.549	3.371	3.202	3.087	2.052	2.494	2.81	2.521	2.429	2.365	2.224	2.286	2.231	2.032	1.937	1.930
Feb.	3.501	3.549	3.371	3.628	2.965	2.002	2.637	2.808	2.521	2.412	2.296	2.271	2.286	2.212	2.037	1.926	1.923
March	3.739	3.549	3.282	3.916	2.787	1.995	2.768	2.767	2.52	2.416	2.302	2.273	2.286	2.215	2.032	1.939	1.923
April	4.110	3.549	3.031	4.08	2.74	2.063	2.87	2.696	2.465	2.421	2.296	2.27	2.317	2.158	2.024	1.97	1.873
May	4.562	3.549	3.021	4.015	2.762	2.123	2.856	2.647	2.427	2.401	2.296	2.249	2.317	2.124	2.012	1.97	1.877
June	5.004	3.549	3.021	3.974	2.64	2.18	2.852	2.596	2.41	2.405	2.304	2.236	2.317	2.11	2.008	1.971	1.895
July	5.334	3.549	3.021	4.087	2.523	2.211	2.832	2.555	2.405	2.415	2.302	2.222	2.317	2.079	2.024	1.976	1.973
Aug.	5.249	3.549	3.021	4.171	2.346	2.325	2.802	2.494	2.39	2.415	2.302	2.242	2.307	2.062	2.014	1.971	1.978
Sept.	5.049	3.549	3.004	4.165	2.239	2.461	2.802	2.457	2.372	2.39	2.293	2.242	2.301	2.053	2.014	1.965	1.982
Oct.	3.470	3.55	3.052	3.987	2.206	2.516	2.802	2.437	2.382	2.399	2.246	2.263	2.28	2.038	2.013	1.97	2.033
Nov.	3.444	3.549	3.084	3.717	2.131	2.49	2.802	2.452	2.416	2.402	2.216	2.274	2.273	2.035	2.008	1.948	2.015
Dec.	3.441	3.461	3.11	3.18	2.094	2.471	2.786	2.504	2.431	2.402	2.217	2.281	2.273	2.021	1.978	1.948	2.028
Aver.	*4.188*	*3.542*	*3.115*	*3.843*	*2.543*	*2.241*	*2.775*	*2.602*	*2.438*	*2.409*	*2.286*	*2.254*	*2.297*	*2.111*	*2.016*	*1.957*	*1.953*

Open-Hearth Steel Billets at Pittsburgh, Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.50	$40.00	$38.00	$35.00	$35.00	$33.00	$33.00	$34.00	$30.00	$27.75	$26.00
Feb.	65.00	47.50	43.50	55.25	41.00	28.00	39.63	40.00	38.00	35.00	33.00	33.00	33.25	33.00	30.00	27.00	26.00
March	66.25	47.50	42.25	60.00	38.50	28.00	44.39	40.00	36.70	35.00	34.00	33.00	34.00	33.00	30.00	27.00	26.00
April	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25	33.00	34.80	33.00	30.00	27.00	26.00
May	86.00	47.50	38.50	60.00	37.00	34.00	45.00	38.50	35.25	35.00	33.00	33.00	36.00	32.50	29.50	27.00	26.00
June	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00	32.25	35.25	31.00	29.00	26.50	26.00
July	100.00	47.50	38.50	65.00	32.25	35.00	42.50	38.00	35.00	35.00	33.00	32.00	35.00	31.00	29.00	26.00	26.00
Aug.	82.50	47.50	38.50	61.00	29.60	35.50	42.50	37.75	35.00	35.00	33.00	32.00	35.00	31.00	29.00	26.00	26.00
Sept.	66.25	47.50	38.50	58.75	29.00	39.50	41.88	36.40	35.00	35.00	33.00	32.00	35.00	31.00	29.00	26.00	26.00
Oct.	50.50	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00	32.80	35.00	31.00	29.00	26.00	26.00
Nov.	47.50	47.50	41.39	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00	33.00	35.00	31.00	29.00	26.00	26.00
Dec.	47.50	45.50	46.40	43.50	29.00	36.50	44.00	36.00	35.00	35.00	33.00	33.00	34.60	30.60	28.80	26.00	26.00
Aver.	*70.58*	*47.33*	*40.54*	*56.43*	*34.36*	*33.90*	*41.75*	*37.99*	*35.62*	*35.00*	*33.27*	*32.67*	*34.66*	*31.84*	*29.36*	*26.51*	*26.00*

Wire Rods at Pittsburgh, Gross Ton

Quotations apply to both open-hearth and Bessemer rods

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$75.00	$57.00	$57.00	$60.00	$57.00	$36.00	$47.00	$51.00	$48.00	$45.00	$45.00	$41.60	$42.00	$40.00	$35.00	$37.00	$35.80
Feb.	77.50	57.00	57.00	63.75	54.50	35.75	49.38	51.00	48.00	45.00	43.00	43.00	42.00	39.75	35.00	37.00	35.00
March	81.00	57.00	55.75	70.00	52.00	36.00	50.00	51.00	48.00	45.00	43.00	44.00	42.00	38.00	35.00	37.00	35.00
April	85.00	57.00	52.00	70.00	49.00	38.00	50.25	51.00	47.00	45.00	42.25	44.00	42.00	38.00	35.00	37.00	35.00
May	86.00	57.00	52.00	72.50	48.00	38.00	51.00	48.75	46.00	45.00	42.00	44.00	42.00	36.00	35.00	37.00	35.00
June	92.50	57.00	52.00	75.00	48.00	38.50	51.00	48.00	45.60	45.00	42.00	42.00	42.00	36.00	35.00	37.00	35.00
July	96.25	57.00	52.00	75.00	43.00	40.00	51.00	48.00	45.00	45.00	42.25	42.00	42.00	36.00	35.00	37.00	35.00
Aug.	94.00	57.00	52.00	75.00	41.80	42.40	51.00	46.50	45.00	45.00	43.00	42.00	42.00	36.00	35.00	37.00	35.00
Sept.	88.75	57.00	52.00	75.00	39.50	46.25	51.00	46.00	45.00	45.00	43.00	42.00	42.00	36.00	35.00	37.00	35.00
Oct.	77.25	57.00	52.00	75.00	40.50	45.00	51.00	45.50	45.00	45.00	42.75	42.00	40.00	36.00	35.00	37.00	35.00
Nov.	57.00	57.00	54.50	66.40	40.00	45.00	51.00	45.00	45.00	45.00	41.00	42.00	40.00	36.00	35.00	37.00	35.00
Dec.	57.00	57.00	59.50	57.00	38.00	45.00	51.00	48.00	45.00	45.00	40.00	42.00	40.00	35.20	35.40	37.00	36.00
Aver.	*79.77*	*57.00*	*53.98*	*69.55*	*45.94*	*40.49*	*50.39*	*48.31*	*46.05*	*45.00*	*42.44*	*42.55*	*41.50*	*36.91*	*35.03*	*37.00*	*35.15*

Steel Rails at Mill, Open-Hearth, Gross Ton

The extra $2 a gross ton, which was for many years charged for open-hearth rails, was annulled with the rail price announced Oct. 22, 1921

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$40.00	$57.00	$57.00	$47.00	$47.00	$40.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$40.00
Feb.	40.00	57.00	57.00	47.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
March	40.00	57.00	54.50	49.50	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
April	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
May	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
June	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
July	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
Aug.	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
Sept.	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00
Oct.	....	57.00	47.00	57.00	45.25	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	42.25	39.55
Nov.	....	57.00	47.00	57.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00	36.38
Dec.	....	57.00	47.00	53.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	40.00	36.38
Aver.	*40.00*	*57.00*	*49.29*	*54.38*	*45.69*	*40.75*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*42.44*	*39.36*

Standard Steel Pipe, at Pittsburgh, Net Ton

Computed from list discounts, for carload lots; price for base size pipe, 1 to 3 in.; ¾ to 3 in. prior to April 13, 1931

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$64.84	$88.92	$83.36	$80.64	$77.30	$51.87	$61.13	$70.30	$70.30	$70.30	$70.30	$68.60	$70.30	$70.30	$66.50	$64.84	$65.00
Feb.	66.95	88.92	83.36	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30	68.60	70.30	70.30	66.50	64.84	65.00
March	72.07	88.92	81.06	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30	68.60	70.30	70.30	66.50	64.84	65.00
April	81.51	88.92	76.88	83.36	71.63	51.87	68.02	70.30	70.30	70.30	70.30	69.88	70.30	66.50	66.50	64.84	58.00
May	92.62	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50	63.59	64.84	58.00
June	95.21	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50	64.84	64.84	58.00
July	105.59	88.92	76.88	83.36	64.63	51.87	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50	64.84	64.84	65.00
Aug.	105.59	88.92	76.88	83.36	63.91	54.74	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50	64.84	64.84	65.00
Sept.	105.59	88.92	76.88	83.36	60.21	57.43	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50	64.84	65.00	65.00
Oct.	105.59	88.92	76.88	83.36	56.50	58.74	70.30	70.30	70.30	70.30	68.54	70.30	70.30	66.50	64.84	65.00	65.00
Nov.	91.70	88.92	76.88	83.36	56.50	61.13	70.30	70.30	70.30	70.30	66.79	70.30	70.30	66.50	64.84	65.00	65.00
Dec.	88.92	88.92	76.88	83.36	53.96	61.13	70.30	70.30	70.30	70.30	66.79	70.30	70.30	66.50	64.84	65.00	65.00
Aver.	*81.73*	*88.92*	*78.31*	*83.13*	*66.14*	*54.69*	*68.71*	*70.30*	*70.30*	*70.30*	*69.57*	*69.84*	*70.30*	*67.45*	*65.29*	*64.89*	*63.25*

Soft Steel Bars at Pittsburgh, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	1.20	1.10	2.03	3.15	2.90	2.70	2.75	2.35	1.50	2.04	2.40	2.10	2.00	1.98	1.81	1.90	1.89	1.64	1.50	1.60
Feb.	1.20	1.10	2.31	3.25	2.90	2.70	3.00	2.15	1.39	2.20	2.40	2.10	2.00	1.90	1.85	1.90	1.85	1.65	1.50	1.60
March	1.20	1.15	2.65	3.63	2.90	2.61	3.63	2.00	1.39	2.39	2.40	2.10	2.00	1.90	1.85	1.90	1.85	1.65	1.52	1.60
April	1.15	1.20	2.88	3.75	2.90	2.35	3.75	2.05	1.50	2.50	2.29	2.05	2.00	1.89	1.85	1.95	1.79	1.65	1.60	1.60
May	1.14	1.20	3.00	4.00	2.90	2.35	3.63	2.10	1.58	2.40	2.24	2.00	1.95	1.85	1.85	1.95	1.75	1.65	1.60	1.60
June	1.11	1.21	2.75	4.25	2.90	2.35	3.50	2.05	1.70	2.40	2.20	2.00	2.00	1.81	1.85	1.95	1.73	1.65	1.60	1.60
July	1.12	1.25	2.63	4.50	2.90	2.35	3.50	1.84	1.70	2.40	2.15	2.00	2.00	1.80	1.85	1.95	1.65	1.63	1.60	1.60
Aug.	1.19	1.30	2.56	4.30	2.90	2.35	3.25	1.74	1.88	2.40	2.13	1.95	2.00	1.80	1.30	1.95	1.64	1.69	1.60	1.60
Sept.	1.20	1.34	2.60	4.00	2.90	2.35	3.25	1.63	2.00	2.40	2.04	1.92	2.00	1.78	1.90	1.94	1.61	1.60	1.60	1.60
Oct.	1.15	1.44	2.75	2.90	2.90	2.39	3.13	1.55	2.00	2.40	2.00	2.00	2.00	1.75	1.91	1.90	1.60	1.60	1.60	1.75
Nov.	1.10	1.62	2.83	2.90	2.90	2.69	2.87	1.50	2.00	2.40	2.03	2.00	2.00	1.77	1.94	1.90	1.60	1.60	1.60	1.75
Dec.	1.07	1.84	3.00	2.90	2.80	2.75	2.35	1.50	2.00	2.40	2.10	2.00	2.00	1.80	1.90	1.90	1.60	1.58	1.60	1.75
Aver.	*1.15*	*1.31*	*2.67*	*3.63*	*2.89*	*2.50*	*3.22*	*1.87*	*1.72*	*2.36*	*2.20*	*2.02*	*2.00*	*1.84*	*1.87*	*1.92*	*1.71*	*1.63*	*1.57*	*1.64*

Structural Shapes at Pittsburgh, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ..	1.20	1.10	1.90	3.25	3.00	2.80	2.47	2.45	1.50	2.06	2.50	2.10	1.90	1.98	1.81	1.90	1.83	1.64	1.50	1.60
Feb. ..	1.20	1.10	2.06	3.25	3.00	2.80	2.70	2.26	1.39	2.20	2.50	2.10	1.90	1.90	1.85	1.90	1.80	1.65	1.50	1.60
March..	1.19	1.10	2.40	3.54	3.00	2.71	3.13	2.08	1.39	2.39	2.39	2.10	1.90	1.90	1.85	1.90	1.80	1.65	1.52	1.60
April ..	1.15	1.20	2.55	3.88	3.00	2.46	3.25	2.10	1.50	2.50	2.29	2.05	1.90	1.88	1.85	1.95	1.80	1.65	1.60	1.60
May ..	1.14	1.20	2.60	4.00	3.00	2.45	3.10	2.20	1.56	2.50	2.24	2.00	1.90	1.80	1.85	1.95	1.73	1.65	1.60	1.60
June ..	1.11	1.20	2.53	4.31	3.00	2.45	3.10	2.10	1.63	2.50	2.20	2.00	1.94	1.80	1.85	1.95	1.69	1.65	1.60	1.60
July ..	1.12	1.25	2.50	4.50	3.00	2.45	3.10	1.93	1.70	2.50	2.09	2.00	2.00	1.80	1.85	1.95	1.65	1.63	1.60	1.60
Aug. ..	1.19	1.30	2.52	4.30	3.00	2.45	3.10	1.82	1.88	2.50	2.00	1.95	2.00	1.80	1.90	1.95	1.61	1.60	1.60	1.60
Sept. ..	1.20	1.35	2.64	4.00	3.00	2.45	3.10	1.64	2.00	2.50	2.00	1.90	2.00	1.78	1.90	1.94	1.60	1.60	1.60	1.60
Oct. ...	1.15	1.44	2.75	3.00	3.00	2.45	3.05	1.60	2.00	2.50	1.93	1.90	2.00	1.75	1.90	1.90	1.60	1.60	1.60	1.70
Nov. ..	1.10	1.60	2.86	3.00	3.00	2.45	2.89	1.54	2.00	2.50	2.00	1.90	2.00	1.77	1.90	1.90	1.60	1.60	1.60	1.70
Dec. ..	1.07	1.78	3.25	3.00	2.90	2.45	2.45	1.50	2.00	2.50	2.10	1.90	2.00	1.80	1.90	1.90	1.60	1.50	1.60	1.70
Aver.	*1.15*	*1.31*	*2.55*	*3.67*	*2.99*	*2.53*	*2.95*	*1.94*	*1.71*	*2.43*	*2.19*	*1.99*	*1.95*	*1.83*	*1.87*	*1.92*	*1.69*	*1.62*	*1.57*	*1.63*

Tank Plates at Pittsburgh, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ..	1.20	1.10	2.25	4.45	3.25	3.00	2.72	2.65	1.48	2.06	2.50	2.00	1.86	1.90	1.81	1.90	1.83	1.64	1.50	1.60
Feb. ..	1.20	1.10	2.56	4.88	3.25	3.00	3.50	2.33	1.39	2.23	2.45	2.00	1.80	1.86	1.85	1.90	1.80	1.65	1.50	1.60
March..	1.18	1.10	3.10	5.25	3.25	2.91	3.63	2.04	1.39	2.39	2.39	2.00	1.86	1.85	1.85	1.90	1.80	1.65	1.52	1.60
April ..	1.15	1.15	3.56	5.88	3.25	2.65	3.75	2.10	1.48	2.50	2.28	2.00	1.90	1.85	1.85	1.95	1.80	1.65	1.60	1.55
May ..	1.12	1.15	3.75	6.60	3.25	2.65	3.75	2.20	1.56	2.50	2.20	2.00	1.86	1.84	1.85	1.95	1.73	1.65	1.60	1.50
June ..	1.10	1.16	3.63	8.00	3.25	2.65	3.55	1.95	1.63	2.50	2.18	1.92	1.88	1.80	1.85	1.95	1.69	1.65	1.60	1.53
July ..	1.10	1.22	3.44	9.00	3.25	2.65	3.38	1.85	1.70	2.50	2.09	1.90	1.90	1.80	1.85	1.95	1.65	1.63	1.60	1.60
Aug. ..	1.18	1.26	3.70	8.80	3.25	2.65	3.25	1.78	1.88	2.50	1.95	1.85	1.90	1.80	1.90	1.95	1.61	1.60	1.60	1.60
Sept. ..	1.20	1.34	4.00	8.00	3.25	2.53	3.25	1.64	2.13	2.50	1.82	1.80	1.90	1.78	1.90	1.95	1.60	1.60	1.60	1.60
Oct. ..	1.14	1.44	4.00	3.25	3.25	2.61	3.09	1.60	2.11	2.50	1.80	1.80	1.90	1.75	1.90	1.94	1.60	1.60	1.60	1.70
Nov. ..	1.08	1.65	4.15	3.25	3.25	2.65	2.81	1.54	1.99	2.50	1.83	1.86	1.90	1.77	1.90	1.90	1.60	1.60	1.60	1.70
Dec. ..	1.05	2.04	4.25	3.25	3.13	2.65	2.65	1.50	1.95	2.50	1.92	1.90	1.90	1.80	1.90	1.90	1.60	1.54	1.60	1.70
Aver.	*1.14*	*1.31*	*3.53*	*5.88*	*3.24*	*2.72*	*3.28*	*1.93*	*1.72*	*2.43*	*2.12*	*1.91*	*1.88*	*1.82*	*1.87*	*1.93*	*1.69*	*1.62*	*1.57*	*1.61*

Hot-Rolled Annealed Sheets, No. 10 Gage, at Pittsburgh, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	3.65	3.55	2.25	2.52	3.00	2.70	2.50	2.25	2.10	2.10	2.10	1.90	1.75	1.62
Feb.	4.25	3.29	2.25	2.64	3.00	2.70	2.50	2.20	2.10	2.10	2.10	1.90	1.75	1.60
March ..	4.50	3.04	2.25	2.95	2.93	2.69	2.50	2.20	2.10	2.10	2.10	1.90	1.71	1.55
April ..	4.50	3.05	2.36	3.25	2.86	2.53	2.43	2.18	2.08	2.10	2.06	1.85	1.70	1.55
May ...	4.50	3.10	2.40	3.20	2.80	2.40	2.40	2.22	2.00	2.13	2.00	1.85	1.70	*1.59
June ...	4.50	2.88	2.40	3.00	2.76	2.31	2.32	2.25	2.00	2.20	2.00	1.85	1.70	1.65
July ...	5.38	2.55	2.40	3.00	2.68	2.30	2.30	2.25	2.00	2.14	2.00	1.85	1.70	1.80
Aug. ...	6.00	2.31	2.44	3.00	2.63	2.30	2.30	2.25	2.00	2.10	1.93	1.85	1.70	1.80
Sept. ...	5.56	2.23	2.44	3.00	2.69	2.25	2.30	2.25	2.00	2.10	1.90	1.85	1.70	1.83
Oct.	4.98	2.25	2.60	3.00	2.70	2.26	2.30	2.14	2.00	2.10	1.90	1.85	1.70	1.90
Nov. ...	4.54	2.25	2.55	3.00	2.70	2.40	2.30	2.10	2.00	2.10	1.90	1.85	1.70	1.90
Dec. ...	3.55	2.25	2.50	3.00	2.70	2.50	2.30	2.10	2.08	2.18	1.90	1.80	1.70	1.90
Aver...	*4.66*	*2.73*	*2.41*	*2.96*	*2.79*	*2.45*	*2.37*	*2.20*	*2.04*	*2.12*	*1.99*	*1.86*	*1.71*	*1.72*

*Since May, 1933, established by adding extra for annealing to base price for hot-rolled sheets, No. 10 gage.

No. 24 Hot-Rolled Annealed Sheets, at Pittsburgh, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ..	1.87	1.80	2.60	4.50	5.00	4.70	4.48	4.35	3.00	3.35	3.83	3.60	3.35	2.91	2.80	2.85	2.65	2.35	2.22	2.02
Feb. ..	1.95	1.80	2.60	4.69	5.00	4.70	5.00	4.21	3.00	3.46	3.85	3.50	3.27	2.80	2.90	2.85	2.61	2.35	2.15	2.00
March.	1.95	1.80	2.71	4.94	5.00	4.61	5.50	3.88	3.00	3.71	3.78	3.44	3.25	2.75	2.89	2.85	2.65	2.31	2.19	2.00
April ..	1.91	1.80	2.85	5.75	5.00	4.35	5.50	3.88	3.11	4.00	3.71	3.35	3.25	2.74	2.77	2.85	2.55	2.25	2.20	2.00
May ..	1.85	1.79	2.89	7.00	5.00	4.35	5.50	4.00	3.15	3.88	3.60	3.20	3.17	2.86	2.71	2.85	2.55	2.15	2.20	2.04
June ..	1.81	1.75	2.90	7.88	5.00	4.35	5.50	3.80	3.15	3.85	3.53	3.15	3.10	3.00	2.65	2.85	2.55	2.20	2.20	2.10
July ..	1.80	1.75	2.90	8.50	5.00	4.35	6.75	3.31	3.15	3.81	3.46	3.13	3.10	3.00	2.62	2.85	2.49	2.40	2.20	2.25
Aug. ..	1.86	1.85	2.90	8.50	5.00	4.34	7.50	2.90	3.23	3.75	3.45	3.15	3.10	3.00	2.65	2.85	2.44	2.40	2.16	2.25
Sept. ..	1.95	1.90	2.93	8.50	5.00	4.35	7.38	2.81	3.35	3.75	3.50	3.14	*2.90	3.00	2.65	2.85	2.42	2.40	2.10	2.25
Oct. ...	1.94	2.03	3.23	...	5.05	4.35	6.69	3.00	3.47	3.75	3.50	3.11	2.97	2.90	2.75	2.77	2.36	2.40	2.17	2.25
Nov. ..	1.87	2.25	3.65	5.00	5.00	4.35	5.77	2.86	3.35	3.75	3.50	3.25	3.00	2.78	2.75	2.75	2.35	2.40	2.10	2.25
Dec. ..	1.82	2.50	4.31	5.00	4.85	4.35	4.35	3.00	3.35	3.75	3.54	3.33	3.00	2.77	2.83	2.75	2.35	2.35	2.10	2.25
Aver.	*1.88*	*1.92*	*3.04*	*6.39*	*4.99*	*4.43*	*5.83*	*3.50*	*3.19*	*3.73*	*3.60*	*3.28*	*2.95*	*2.88*	*2.75*	*2.83*	*2.50*	*2.33*	*2.17*	*2.14*

*No. 24 gage was made the base in September, 1926; prices prior to that time are for No. 28 gage.

No. 24 Gage Galvanized Sheets, at Pittsburgh, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ..	2.87	2.79	4.75	6.25	6.25	6.05	5.33	5.70	4.00	4.35	4.98	4.75	4.60	3.78	3.65	3.60	3.33	2.90	2.80	2.68
Feb. ..	2.95	3.16	4.75	6.38	6.25	6.05	6.50	5.56	4.00	4.54	5.00	4.75	4.53	3.71	3.65	3.60	3.30	2.90	2.75	2.50
March..	2.95	3.40	4.75	6.69	6.25	5.96	7.00	5.05	4.00	4.93	4.93	4.62	4.50	3.65	3.65	3.60	3.30	2.90	2.85	2.60
April ..	2.91	3.29	5.00	7.00	6.25	5.70	7.00	4.88	4.11	5.25	4.88	4.45	4.50	3.63	3.65	3.60	3.30	2.84	2.85	2.63
May ..	2.80	3.50	4.94	8.20	6.25	5.70	7.00	5.00	4.15	5.20	4.80	4.29	4.43	3.72	3.58	3.60	3.23	2.80	2.85	2.70
June ..	2.75	4.28	4.69	9.50	6.25	5.70	7.00	4.88	4.15	5.00	4.76	4.21	4.28	3.85	3.50	3.60	3.19	2.74	2.85	2.70
July ..	2.75	4.40	4.38	10.00	6.25	5.70	8.25	4.31	4.15	5.00	4.56	4.19	4.24	3.85	3.46	3.60	3.13	2.90	2.85	2.85
Aug. ..	2.85	3.71	4.21	10.00	6.25	5.70	9.00	3.90	4.23	5.00	5.55	4.20	4.23	3.85	3.40	3.50	3.05	2.90	2.81	2.85
Sept. ..	2.95	3.56	4.18	9.75	6.25	5.70	8.88	3.81	4.35	5.00	4.60	4.20	*3.83	3.85	3.40	3.50	3.00	2.90	2.75	2.85
Oct. ...	2.95	3.50	4.41	...	6.25	5.70	8.18	4.00	4.50	5.00	4.60	4.23	3.85	3.76	3.50	3.50	2.99	2.90	2.85	2.85
Nov. ..	2.88	3.89	5.18	6.25	6.25	5.70	7.04	3.86	4.43	4.93	4.60	4.50	3.85	3.66	3.50	3.48	2.95	2.90	2.85	2.85
Dec. ..	2.78	4.75	6.00	6.25	6.15	5.70	5.70	4.00	4.35	4.89	4.72	4.60	3.85	3.63	3.58	3.40	2.92	2.86	2.85	2.85
Aver..	*2.87*	*3.69*	*4.77*	*7.84*	*6.24*	*5.78*	*7.24*	*4.58*	*4.20*	*4.92*	*4.75*	*4.42*	*3.89*	*3.75*	*3.54*	*3.55*	*3.14*	*2.87*	*2.83*	*2.74*

*No. 24 gage was made the base in September, 1926. Quotations prior to that time are for No. 28 gage, for which there is now an extra of 50c. per 100 lb.

Automobile Body and Light Cold-Rolled Sheets, No. 20 Gage, at Pittsburgh, Cents a Pound

Automobile Body Classification Dropped in November, 1932. Quotations for 1933 are on Light Cold-Rolled Sheets

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ...	5.45	5.20	4.35	4.70	5.35	4.75	4.50	4.18	4.00	4.10	3.90	3.30	2.90	2.35
Feb. ...	5.60	5.20	4.35	4.78	5.35	4.68	4.43	4.15	4.08	4.10	3.90	3.90	2.80	2.25
March ..	5.80	5.20	4.35	5.00	5.35	4.46	4.40	4.15	4.15	4.10	3.88	3.24	2.86	2.30
April ...	6.15	5.20	4.40	5.00	5.25	4.40	4.33	4.15	4.04	4.10	3.80	3.10	2.90	2.30
May ...	6.25	5.20	4.45	5.35	5.10	4.40	4.29	4.15	4.00	4.10	3.75	3.03	2.89	2.34
June ...	6.20	4.95	4.50	5.35	5.10	4.22	4.20	4.25	4.00	4.10	3.65	3.02	2.85	2.29
July ...	6.80	4.70	4.60	5.35	5.06	4.15	4.20	4.25	4.00	4.10	3.60	3.10	2.85	2.40
Aug. ...	6.95	4.65	4.75	5.35	4.75	4.25	4.20	4.25	4.00	4.08	3.60	3.10	2.81	2.47
Sept. ...	7.00	4.45	4.85	5.35	4.72	4.25	*4.25	4.25	4.00	4.00	3.50	3.10	2.75	2.75
Oct.	7.00	4.55	4.85	5.35	4.60	4.29	4.25	4.15	4.00	4.00	3.45	3.10	2.65	2.75
Nov. ...	6.60	4.35	4.85	5.35	4.60	4.40	4.25	4.12	4.00	4.00	3.38	3.10	2.63	2.75
Dec. ...	5.25	4.35	4.70	5.35	4.75	4.50	4.25	4.00	4.08	3.98	3.30	3.02	2.65	2.75
Aver...	*6.25*	*4.83*	*4.58*	*5.19*	*5.00*	*4.39*	*4.30*	*4.17*	*4.03*	*4.06*	*3.64*	*3.13*	*2.80*	*2.48*

*No. 22 gage prior to Sept. 1, 1926.

Hot-Rolled Strip Steel, at Pittsburgh, Cents a Pound

(Prices quoted only on strip wider than 6-in. prior to June 1, 1932.)

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	...	4.50	3.30	3.45	3.30	2.00	2.75	3.00	2.25	2.30	2.34	2.01	1.80	1.80	1.55	1.41	1.45
Feb.	...	4.50	3.30	4.63	3.11	1.84	2.86	3.00	2.35	2.30	2.21	2.08	1.80	1.80	1.55	1.40	1.45
March	...	4.50	3.30	5.00	2.93	1.81	3.18	2.93	2.40	2.30	2.30	2.10	1.80	1.79	1.55	1.40	1.45
April	...	4.50	3.30	5.25	2.76	1.98	3.30	2.75	2.40	2.30	2.30	2.10	1.90	1.70	1.55	1.40	1.45
May	...	4.25	3.30	5.50	2.53	2.20	2.30	2.75	2.20	2.30	2.30	1.96	1.90	1.70	1.55	1.40	1.49
June	...	3.50	3.05	5.50	2.50	2.40	3.23	2.50	2.20	2.30	2.30	1.85	1.90	1.69	1.55	1.41	1.55
July	...	3.50	3.05	5.50	2.46	2.50	3.00	2.50	2.20	2.30	2.30	1.85	1.90	1.65	1.55	1.45	1.60
Aug.	...	3.50	3.31	5.50	2.23	2.60	3.00	2.35	2.20	2.30	2.30	1.85	1.90	1.65	1.55	1.45	1.64
Sept.	...	3.50	3.30	5.50	2.00	2.75	3.00	2.25	2.20	2.30	2.30	1.85	1.90	1.65	1.55	1.45	1.68
Oct.	...	3.50	3.30	5.25	2.00	2.90	3.00	2.25	2.23	2.30	2.19	1.85	1.90	1.60	1.54	1.45	1.75
Nov.	4.50	3.50	3.30	4.70	2.00	2.83	3.00	2.25	2.30	2.30	2.10	1.88	1.90	1.58	1.50	1.45	1.75
Dec.	4.50	3.50	3.30	3.65	2.00	2.75	2.88	2.25	2.30	2.30	2.03	1.80	1.90	1.55	1.49	1.45	1.75
Aver.	...	*3.90*	*3.26*	*4.95*	*2.49*	*2.38*	*3.04*	*2.57*	*2.27*	*2.30*	*2.26*	*1.93*	*1.88*	*1.68*	*1.54*	*1.43*	*1.58*

Cold-Rolled Strip Steel, at Pittsburgh, Cents a Pound

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	7.00	6.50	6.25	6.00	6.25	3.50	4.50	5.00	4.00	3.90	2.95	3.00	2.85	2.65	2.25	1.92	1.88
Feb.	7.25	6.50	6.25	7.00	6.06	3.50	4.69	4.75	4.00	3.90	2.80	3.00	2.85	2.65	2.25	1.90	1.80
March	7.63	6.50	6.10	7.00	5.83	3.50	5.00	4.75	4.00	3.90	2.92	3.00	2.80	2.60	2.25	1.96	1.80
April	7.31	6.50	5.65	7.75	5.54	3.61	5.25	4.75	4.00	3.79	3.00	3.00	2.75	2.55	2.23	2.00	1.80
May	7.60	6.50	5.65	8.50	4.98	3.71	5.25	4.50	3.94	3.75	3.00	3.00	2.75	2.50	2.15	2.00	1.88
June	8.63	6.50	5.65	8.50	4.88	4.00	5.19	4.50	3.53	3.72	3.19	3.00	2.75	2.45	2.15	2.00	2.00
July	9.00	6.50	5.65	8.50	4.25	4.00	5.00	4.30	3.63	3.60	3.25	2.92	2.75	2.45	2.15	2.00	2.19
Aug.	9.00	6.50	5.65	8.50	3.96	4.10	5.00	4.13	3.75	3.60	3.25	2.90	2.75	2.35	2.15	2.00	2.25
Sept.	9.00	6.50	5.65	8.50	3.78	4.25	5.00	4.00	3.75	3.50	3.25	2.72	2.75	2.35	2.15	1.92	2.29
Oct.	9.00	6.50	5.65	8.25	3.75	4.50	5.00	4.00	3.75	3.25	3.00	2.75	2.75	2.35	2.13	1.90	2.40
Nov.	6.75	6.50	5.65	8.00	3.75	4.50	4.98	4.00	3.90	3.25	3.00	2.85	2.75	2.33	2.05	2.00	2.40
Dec.	6.50	6.35	5.93	6.63	3.75	4.50	4.91	4.00	3.90	3.00	3.00	2.85	2.75	2.25	2.03	2.00	2.40
Aver.	*7.89*	*6.49*	*5.81*	*7.76*	*4.73*	*3.97*	*4.98*	*4.39*	*3.85*	*3.60*	*3.05*	*2.92*	*2.77*	*2.46*	*2.16*	*1.97*	*2.09*

Tin Plate at Pittsburgh, Dollars a Base Box

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$3.32	$3.10	$3.75	$7.00	$7.75	$7.35	$7.00	$7.00	$4.75	$4.75	$5.50	$5.50	$5.50	$5.50	$5.25	$5.35	$5.25	$5.00	$4.75	$4.25
Feb.	3.29	3.10	3.96	7.38	7.75	7.35	7.00	7.00	4.71	4.80	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
March	3.30	3.25	4.19	8.00	7.75	7.26	7.00	7.00	4.60	5.23	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
April	3.30	3.25	4.50	8.00	7.75	7.00	7.00	6.44	4.75	6.00	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
May	3.30	3.15	5.30	8.40	7.75	7.00	7.00	6.25	4.75	5.70	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
June	3.30	3.11	5.81	10.50	7.75	7.00	7.00	6.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
July	3.27	3.10	6.00	12.00	7.75	7.00	7.50	5.69	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
Aug.	3.41	3.10	5.95	11.40	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25
Sept.	3.35	3.15	5.75	12.00	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.65
Oct.	3.24	3.15	5.81	...	7.75	7.00	8.33	5.13	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.00	4.75	4.75	4.65
Nov.	3.15	3.28	5.97	7.75	7.75	7.00	7.50	4.75	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.00	4.75	4.55	4.65
Dec.	3.13	3.52	6.63	7.75	7.55	7.00	7.00	4.73	4.75	5.50	5.50	5.50	5.50	5.25	5.25	5.35	5.00	4.75	4.25	5.25
Aver.	*3.28*	*3.19*	*5.30*	*9.11*	*7.73*	*7.08*	*7.53*	*5.90*	*4.73*	*5.42*	*5.50*	*5.50*	*5.50*	*5.48*	*5.25*	*5.35*	*5.19*	*4.94*	*4.69*	*4.43*

Wire Nails at Pittsburgh, Keg of 100 Lb.

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$1.54	$1.54	$2.13	$3.00	$3.50	$3.50	$4.50	$3.25	$2.50	$2.70	$3.00	$2.85	$2.65	$2.64	$2.54	$2.65	$2.33	$1.90	$1.95	$1.86
Feb.	1.60	1.57	2.25	3.00	3.50	3.50	4.50	3.21	2.40	2.78	3.00	2.85	2.65	2.56	2.63	2.65	2.25	1.90	1.95	1.83
March	1.60	1.60	2.40	3.20	3.50	3.44	4.00	3.02	2.40	2.83	3.00	2.85	2.65	2.55	2.65	2.65	2.25	1.90	1.95	1.85
April	1.60	1.56	2.40	3.28	3.50	3.25	4.00	3.13	2.40	2.93	3.00	2.80	2.65	2.55	2.65	2.65	2.16	1.90	1.95	1.85
May	1.56	1.55	2.50	3.50	3.50	3.25	4.00	3.05	2.40	3.00	2.93	2.75	2.65	2.50	2.55	2.65	2.15	1.85	1.95	1.85
June	1.50	1.55	2.50	3.75	3.50	3.25	4.00	3.00	2.40	3.00	2.90	2.68	2.65	2.50	2.55	2.65	2.13	1.80	1.95	1.85
July	1.52	1.60	2.50	4.00	3.50	3.25	4.00	2.81	2.40	3.00	2.88	2.65	2.65	2.53	2.55	2.64	2.05	1.80	1.95	2.04
Aug.	1.56	1.61	2.58	4.00	3.50	3.25	4.25	2.75	2.48	3.00	2.81	2.65	2.65	2.55	2.55	2.55	2.04	1.88	1.95	2.10
Sept.	1.60	1.69	2.60	4.00	3.50	3.25	4.25	2.86	2.63	3.00	2.78	2.65	2.65	2.55	2.55	2.50	2.00	1.90	1.95	2.10
Oct.	1.60	1.80	2.63	...	3.50	3.31	4.25	2.90	2.70	3.00	2.75	2.63	2.65	2.54	2.55	2.43	1.99	1.90	1.95	2.10
Nov.	1.50	1.87	2.85	3.50	3.50	3.50	4.05	2.84	2.70	3.00	2.75	2.65	2.65	2.50	2.55	2.40	1.93	1.90	1.95	2.10
Dec.	1.51	2.04	3.00	3.50	3.50	4.12	3.25	2.69	2.70	3.00	2.85	2.65	2.65	2.50	2.63	2.40	1.90	1.93	1.95	2.35
Aver.	*1.56*	*1.67*	*2.53*	*3.52*	*3.50*	*3.41*	*4.09*	*2.96*	*2.51*	*2.94*	*2.89*	*2.72*	*2.65*	*2.54*	*2.58*	*2.57*	*2.10*	*1.88*	*1.95*	*1.99*

Plain Wire, Base, at Pittsburgh, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	1.35	1.34	1.98	2.95	3.25	3.25	3.25	3.25	2.25	2.45	2.75	2.60	2.50	2.49	2.40	2.50	2.40	2.20	2.20	2.16
Feb.	1.40	1.39	2.10	2.95	3.25	3.25	3.50	3.13	2.20	2.63	2.75	2.60	2.50	2.41	2.48	2.50	2.40	2.20	2.20	2.10
March	1.40	1.40	2.25	3.11	3.25	3.19	3.50	3.00	2.25	2.65	2.75	2.60	2.50	2.40	2.50	2.50	2.40	2.20	2.20	2.10
April	1.40	1.37	2.25	3.23	3.25	3.00	3.50	3.00	2.25	2.68	2.75	2.50	2.50	2.40	2.50	2.50	2.38	2.20	2.20	2.10
May	1.36	1.35	2.45	3.45	3.25	3.00	3.50	3.00	2.25	2.75	2.68	2.50	2.50	2.40	2.50	2.50	2.30	2.20	2.20	2.10
June	1.30	1.35	2.45	3.70	3.25	3.00	3.50	2.75	2.25	2.75	2.65	2.49	2.50	2.40	2.50	2.50	2.30	2.20	2.20	2.10
July	1.32	1.39	2.45	3.95	3.25	3.00	3.50	2.56	2.25	2.75	2.63	2.50	2.50	2.40	2.42	2.50	2.30	2.20	2.20	2.10
Aug.	1.36	1.43	2.53	3.95	3.25	3.00	3.69	2.50	2.29	2.75	2.56	2.50	2.50	2.40	2.40	2.43	2.30	2.20	2.20	2.10
Sept.	1.40	1.54	2.55	3.95	3.25	3.00	3.75	2.58	2.39	2.75	2.53	2.50	2.50	2.40	2.40	2.40	2.30	2.20	2.20	2.10
Oct.	1.40	1.65	2.60	3.25	3.25	3.17	3.75	2.60	2.45	2.75	2.50	2.50	2.50	2.40	2.40	2.40	2.30	2.20	2.20	2.10
Nov.	1.39	1.72	2.80	3.25	3.25	3.29	3.65	2.56	2.45	2.75	2.50	2.50	2.50	2.40	2.40	2.40	2.30	2.20	2.20	2.10
Dec.	1.31	1.89	2.95	3.25	3.25	3.21	3.25	2.44	2.45	2.75	2.60	2.50	2.50	2.40	2.48	2.40	2.22	2.20	2.20	2.20
Aver.	*1.37*	*1.48*	*2.47*	*3.43*	*3.25*	*3.11*	*3.53*	*2.78*	*2.31*	*2.70*	*2.64*	*2.52*	*2.50*	*2.41*	*2.45*	*2.46*	*2.33*	*2.20*	*2.20*	*2.11*

Cold-Finished Steel Bars at Pittsburgh, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	2.80	2.50	2.30	2.20	2.20	2.15	2.08	2.00	1.70
Feb.	2.80	2.50	2.30	2.20	2.20	2.10	2.10	2.00	1.70
March	2.72	2.50	2.38	2.20	2.20	2.10	2.10	2.00	1.70
April	2.70	2.50	2.40	2.20	2.30	2.10	2.10	2.00	1.70
May	2.70	2.50	2.40	2.20	2.30	2.10	2.10	1.82	1.70
June	2.60	2.50	2.33	2.20	2.30	2.10	2.10	1.70	1.70
July	2.60	2.50	2.20	2.10	2.30	2.10	2.10	1.70	1.70
Aug.	2.50	2.50	2.20	2.10	2.30	2.10	2.10	1.70	1.70
Sept.	2.46	2.50	2.15	2.10	2.30	2.10	2.10	1.70	1.95
Oct.	2.40	2.40	2.10	2.16	2.30	2.10	2.10	1.70	1.95
Nov.	2.48	2.30	2.10	2.20	2.30	2.00	2.10	1.70	1.95
Dec.	2.50	2.30	2.10	2.20	2.30	2.00	2.02	1.70	2.10
Aver.	*2.61*	*2.46*	*2.25*	*2.17*	*2.28*	*2.09*	*2.09*	*1.81*	*1.80*

Large Structural Rivets at Pittsburgh, Dollars a CWT

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$2.60	$2.60	$2.34	$2.75	$2.90	$3.10	$2.75	$2.25	$2.25
Feb.	2.60	2.53	2.30	2.75	2.90	3.10	2.75	2.25	2.25
March	2.60	2.50	2.30	2.90	2.90	3.10	2.75	2.25	2.25
April	2.58	2.50	2.75	2.90	3.06	3.10	2.75	2.25	2.25
May	2.45	2.50	2.75	2.90	3.10	2.95	2.75	2.25	2.25
June	2.40	2.50	2.75	2.90	3.10	2.90	2.75	2.25	2.38
July	2.40	2.50	2.75	2.90	3.10	2.90	2.75	2.25	2.50
Aug.	2.40	2.50	2.75	2.90	3.10	2.79	2.75	2.25	2.50
Sept.	2.40	2.48	2.75	2.90	3.10	2.75	2.55	2.25	2.50
Oct.	2.40	2.45	2.75	2.90	3.10	2.75	2.25	2.25	2.65
Nov.	2.60	2.45	3.00	2.90	3.10	2.75	2.25	2.25	2.75
Dec.	2.60	2.40	2.75	2.90	3.10	2.75	2.25	2.25	2.75
Aver.	*2.50*	*2.50*	*2.66*	*2.88*	*3.05*	*2.91*	*2.61*	*2.25*	*2.44*

Finished Iron and Steel at Chicago

Soft Steel Bars at Chicago, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	2.13	2.10	2.10	1.91	2.00	1.99	1.71	1.68	1.70
Feb.	2.20	2.10	2.03	1.95	2.01	1.95	1.72	1.65	1.70
March	2.20	2.10	2.00	1.98	2.05	1.95	1.70	1.68	1.70
April	2.15	2.10	2.00	2.00	2.05	1.91	1.75	1.70	1.70
May	2.10	2.10	2.00	2.00	2.05	1.85	1.70	1.70	1.70
June	2.10	2.10	2.00	2.00	2.05	1.83	1.70	1.70	1.70
July	2.10	2.10	2.00	2.00	2.05	1.75	1.70	1.70	1.70
Aug.	2.10	2.10	1.98	2.00	2.05	1.75	1.70	1.70	1.69
Sept.	2.10	2.10	1.90	2.00	2.05	1.71	1.70	1.70	1.65
Oct.	2.10	2.10	1.85	2.00	2.03	1.70	1.70	1.70	1.80
Nov.	2.10	2.10	1.87	2.00	2.00	1.70	1.70	1.70	1.80
Dec.	2.10	2.10	1.90	2.00	2.00	1.70	1.60	1.70	1.80
Aver.	*2.12*	*2.10*	*1.97*	*1.99*	*2.03*	*1.82*	*1.70*	*1.69*	*1.72*

Structural Shapes at Chicago, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	2.23	2.10	2.10	1.91	2.00	1.99	1.71	1.68	1.70
Feb.	2.30	2.10	2.03	1.95	2.01	1.95	1.72	1.65	1.70
March	2.30	2.10	2.00	1.98	2.05	1.94	1.70	1.68	1.70
April	2.25	2.10	2.00	2.00	2.05	1.90	1.75	1.70	1.70
May	2.20	2.10	2.00	2.00	2.05	1.83	1.70	1.70	1.70
June	2.18	2.00	2.00	2.00	2.05	1.79	1.70	1.70	1.70
July	2.10	2.10	2.00	2.00	2.05	1.75	1.70	1.70	1.70
Aug.	2.10	2.10	1.94	2.00	2.05	1.75	1.70	1.70	1.69
Sept.	2.10	2.10	1.90	2.00	2.05	1.71	1.70	1.70	1.65
Oct.	2.10	2.10	1.85	2.00	2.03	1.70	1.70	1.70	1.75
Nov.	2.10	2.10	1.87	2.00	2.00	1.70	1.70	1.70	1.75
Dec.	2.10	2.10	1.90	2.00	2.00	1.70	1.60	1.70	1.75
Aver.	*2.17*	*2.10*	*1.97*	*1.99*	*2.03*	*1.81*	*1.70*	*1.69*	*1.71*

Rail Steel Bars at Chicago District Mill, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	2.03	2.00	1.90	1.80	1.90	1.88	1.60	1.50	1.50
Feb.	2.10	2.00	1.90	1.80	1.95	1.80	1.60	1.50	1.50
March	2.10	2.00	1.90	1.80	1.95	1.85	1.60	1.50	1.50
April	2.10	2.00	1.90	1.83	1.95	1.81	1.60	1.50	1.50
May	2.10	1.98	1.90	1.85	1.95	1.80	1.60	1.50	1.50
June	2.02	1.96	1.90	1.86	1.95	1.75	1.60	1.50	1.50
July	2.00	1.98	1.90	1.85	1.95	1.75	1.60	1.50	1.50
Aug.	2.00	2.00	1.90	1.85	1.95	1.65	1.60	1.50	1.51
Sept.	2.00	2.00	1.90	1.85	1.95	1.65	1.60	1.50	1.55
Oct.	2.00	2.00	1.83	1.95	1.95	1.65	1.54	1.50	1.70
Nov.	2.00	1.96	1.80	1.95	1.94	1.64	1.50	1.50	1.70
Dec.	2.00	1.90	1.80	1.95	1.90	1.60	1.50	1.50	1.70
Aver.	*2.04*	*1.98*	*1.88*	*1.86*	*1.94*	*1.74*	*1.58*	*1.50*	*1.56*

Common Bar Iron at Chicago, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	2.00	2.00	2.00	1.90	2.00	1.98	1.71	1.68	1.60
Feb.	2.03	2.00	2.00	1.93	2.00	1.95	1.73	1.70	1.60
March	2.10	2.00	2.00	2.00	2.04	1.95	1.70	1.70	1.60
April	2.10	2.00	2.00	2.00	2.05	1.92	1.74	1.70	1.60
May	2.08	2.00	2.00	2.00	2.05	1.90	1.70	1.66	1.60
June	2.01	2.00	2.00	2.00	2.05	1.90	1.70	1.65	1.60
July	1.96	2.00	2.00	2.00	2.05	1.90	1.70	1.65	1.60
Aug.	1.90	2.00	2.00	2.00	2.05	1.75	1.70	1.62	1.60
Sept.	1.90	2.00	1.98	2.00	2.05	1.74	1.70	1.60	1.60
Oct.	1.90	2.00	1.88	2.00	2.04	1.70	1.70	1.60	1.60
Nov.	1.94	2.00	1.88	2.00	2.00	1.70	1.70	1.60	1.60
Dec	2.00	2.00	1.90	2.00	2.00	1.70	1.60	1.60	1.60
Aver.	*1.99*	*2.00*	*1.97*	*1.99*	*2.03*	*1.84*	*1.70*	*1.65*	*1.60*

No. 24 Gage Hot-Rolled Annealed Sheets at Chicago District Mills, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	3.75	3.50	3.20	3.03	3.00	2.85	2.45	2.35	2.12
Feb.	3.75	3.50	2.98	3.05	3.00	2.80	2.45	2.25	2.00
March	3.75	3.50	3.00	3.05	3.10	2.80	2.41	2.29	2.10
April	3.65	3.48	3.00	3.01	3.10	2.70	2.35	2.30	2.10
May	3.48	3.40	3.12	2.87	3.10	2.70	2.35	2.30	2.14
June	3.32	3.31	3.15	2.83	3.10	2.70	2.35	2.30	2.20
July	3.35	3.30	3.15	2.80	3.10	2.69	2.50	2.30	2.35
Aug.	3.35	3.30	3.15	2.80	3.05	2.55	2.50	2.30	2.35
Sept.	3.35	*3.07	3.15	2.80	3.00	2.52	2.50	2.26	2.35
Oct.	3.31	3.18	3.05	2.86	3.00	2.53	2.50	2.28	2.35
Nov.	3.43	3.25	2.94	2.90	2.88	2.45	2.50	2.20	2.35
Dec.	3.50	3.25	2.90	2.93	2.80	2.45	2.45	2.20	2.35
Aver.	*3.50*	*3.34*	*3.07*	*2.91*	*3.02*	*2.65*	*2.44*	*2.28*	*2.23*

*No. 28 gage to September, 1926; subsequent quotations for No. 24 gage.

Galvanized Sheets at Chicago District Mill, Cents a Pound

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	4.90	4.75	4.03	3.88	3.75	3.60	3.00	2.90	2.76
Feb.	4.90	4.75	3.90	3.90	3.75	3.40	3.00	2.87	2.55
March	4.80	4.75	3.90	3.90	3.85	3.40	3.00	2.93	2.70
April	4.75	4.75	3.90	3.86	3.85	3.40	2.90	2.95	2.73
May	4.55	4.68	3.98	3.75	3.85	3.33	2.90	2.95	2.86
June	4.39	4.55	4.00	3.70	3.85	3.29	2.87	2.95	2.95
July	4.38	4.45	4.00	3.65	3.85	3.25	3.00	2.95	2.95
Aug.	4.39	4.45	4.00	3.65	3.70	3.18	3.00	2.91	2.95
Sept.	4.40	*3.94	4.00	3.65	3.65	3.10	3.00	2.85	2.95
Oct.	4.41	4.04	3.95	3.65	3.65	3.10	3.00	2.95	2.95
Nov.	4.68	4.10	3.85	3.65	3.60	3.10	3.00	2.95	2.95
Dec.	4.75	4.10	3.70	3.68	3.50	3.04	2.96	2.95	2.95
Aver.	*4.62*	*4.44*	*3.93*	*3.74*	*3.74*	*3.27*	*2.97*	*2.93*	*2.85*

*No. 28 gage to September, 1926; subsequent quotations for No. 24 gage.

Wrought Iron Pipe, at Pittsburgh, Net Ton

Computed from list discounts, for carload lots; price for base size pipe, 1½ in.; 1½ and 2 in. prior to Oct. 1, 1932.

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$83.36	$122.27	$116.71	$115.60	$135.06	$100.96	$122.56	$131.10	$131.10	$127.82	$127.82	$127.82	$118.56	$118.56	$118.56	$118.56	$120.00
Feb.	85.48	122.27	116.71	119.49	136.16	100.96	127.82	131.10	131.10	127.82	127.82	127.82	118.56	118.56	118.56	116.71	120.00
March	90.65	122.27	114.41	119.49	136.16	100.96	127.82	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	120.00
April	101.89	122.27	110.22	119.49	125.66	100.96	129.02	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	114.75
May	113.00	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00
June	114.85	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00
July	122.27	122.27	110.22	119.49	111.65	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00
Aug.	122.27	122.27	110.22	119.49	110.22	105.74	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00
Sept.	122.27	122.27	110.22	119.49	105.59	116.33	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	116.14	113.00
Oct.	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	120.00	113.00
Nov.	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	120.00	113.00
Dec.	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	120.00	113.00
Aver.	*110.24*	*122.27*	*111.65*	*119.16*	*116.55*	*107.50*	*129.67*	*131.10*	*128.37*	*127.82*	*127.82*	*127.82*	*118.56*	*118.56*	*118.56*	*116.71*	*114.90*

Cast Iron Pipe, Net Ton

At New York, 6-in., and Larger

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$41.50	$55.35	$65.70	$66.30	$63.30	$47.30	$54.90	$61.60	$54.60	$50.60	$48.60	$37.25	$39.60	$36.10	$37.90	$30.20	$35.30
Feb.	41.50	55.35	62.70	70.30	63.30	47.30	56.50	61.60	54.60	50.60	48.60	37.25	39.35	38.60	37.90	29.70	35.30
March	43.10	55.35	62.70	71.30	63.30	47.68	57.75	61.60	53.00	50.60	47.20	37.25	38.60	38.75	37.90	28.40	35.30
April	50.88	55.35	57.70	73.90	63.30	48.80	58.50	61.60	52.60	50.60	47.35	36.25	37.40	39.50	35.40	28.20	35.30
May	55.50	56.60	54.45	76.30	62.05	49.60	58.50	61.60	50.85	50.60	45.80	37.60	35.85	39.90	34.15	28.20	35.30
June	60.75	61.44	52.03	76.30	54.30	50.80	61.35	61.60	50.60	50.60	44.42	37.60	35.10	39.90	33.70	28.20	38.30
July	65.50	61.75	50.46	76.30	52.30	53.50	62.30	60.60	50.60	50.60	42.75	37.60	33.20	39.30	32.90	28.73	38.30
Aug.	65.50	61.75	52.33	76.53	46.05	54.10	62.62	59.60	50.60	50.60	39.65	36.60	33.60	38.90	32.90	31.10	38.30
Sept.	65.50	61.75	54.30	77.22	46.30	54.50	63.60	56.60	50.60	49.85	37.25	35.60	33.60	38.90	32.90	31.30	38.30
Oct.	61.00	67.70	55.30	77.22	47.30	54.50	63.60	56.35	50.60	49.60	36.50	35.60	34.60	38.90	32.90	33.30	38.00
Nov.	56.50	67.70	58.30	77.22	47.30	54.50	63.60*	55.60	50.60	49.60	36.25	37.32	34.60	38.65	32.90	33.30	43.00
Dec.	56.50	67.70	61.30	68.87	47.30	54.75	63.60*	55.20	50.60	49.10	37.00	39.40	34.60	37.90	32.50	34.30	43.00
Aver.	*55.31*	*60.65*	*57.27*	*73.98*	*54.68*	*51.44*	*60.57*	*59.46*	*51.65*	*50.25*	*42.61*	*37.11*	*35.84*	*38.78*	*34.50*	*30.41*	*37.81*

*Concession of $2 to $3 a ton from this price to consumers willing to accept winter delivery.

At Chicago, 6-in. and Larger

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$41.50	$54.30	$64.30	$67.55	$64.10	$42.50	$51.80	$56.20	$48.70	$49.20	$44.32	$35.00	$43.33	$42.20	$43.00	$40.40	$40.00
Feb.	41.75	54.30	61.80	71.30	64.10	41.60	53.20	56.20	49.95	49.20	43.70	35.83	44.45	44.95	44.00	40.40	40.90
March	43.00	54.30	60.55	72.80	64.10	42.10	54.20	56.20	47.60	49.20	44.20	35.70	44.70	45.20	43.20	38.90	41.40
April	53.00	54.30	56.80	74.80	64.10	42.85	57.20	56.20	46.70	49.20	43.95	36.20	44.20	45.20	43.00	36.40	41.40
May	55.50	55.81	54.30	76.80	60.10	44.60	60.20	55.20	47.07	49.20	43.20	37.80	44.20	45.15	43.00	36.40	41.40
June	60.75	60.83	51.80	76.80	48.85	45.47	60.20	54.70	48.20	48.90	42.70	40.20	45.20	45.00	42.20	36.40	42.90
July	65.50	62.05	52.60	76.50	52.85	46.10	60.20	54.80	47.70	47.95	41.58	40.80	45.20	45.00	42.00	34.40	43.40
Aug.	65.50	61.80	55.30	78.18	43.20	46.40	60.20	53.45	49.20	48.30	37.40	42.20	45.20	44.75	42.00	35.20	43.40
Sept.	65.50	61.80	55.80	82.10	42.60	47.45	59.95	51.80	49.20	47.58	34.58	42.20	45.20	43.60	42.00	38.40	43.40
Oct.	53.50	66.80	59.00	83.10	42.60	51.20	57.40	49.70	49.20	47.20	34.20	43.00	43.70	44.00	41.60	38.40	43.00
Nov.	54.25	66.80	59.80	83.10	42.90	51.20	55.45	48.20	50.20	46.70	34.50	45.20	43.70	44.00	40.50	38.40	43.20
Dec.	55.21	66.80	64.40	68.60	43.10	51.20	55.20	47.60	50.20	46.70	35.08	43.10	43.70	43.60	40.20	38.40	44.00
Aver.	*54.58*	*59.99*	*58.04*	*76.00*	*52.72*	*46.06*	*57.10*	*53.35*	*48.66*	*48.32*	*39.95*	*39.77*	*44.39*	*44.39*	*42.23*	*37.60*	*42.37*

No. 1 Heavy Melting Steel Scrap Composite Price

(Average of Pittsburgh, Chicago and Philadelphia Quotations, Gross Ton)

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$21.73	$29.93	$17.77	$25.13	$14.04	$12.45	$20.22	$19.15	$20.10	$16.97	$15.17	$13.70	$17.02	$14.65	$11.30	$8.41	$6.77
Feb.	21.35	29.92	14.75	26.00	15.21	12.46	21.46	19.21	18.27	15.50	14.58	13.71	16.96	14.92	11.15	8.27	6.83
March	23.60	29.58	14.52	25.50	13.17	13.46	24.79	17.56	16.92	15.83	14.65	13.65	16.71	14.88	11.10	8.23	6.96
April	26.63	28.47	15.79	24.42	11.63	14.71	24.00	15.20	15.48	15.27	14.71	13.81	17.18	14.30	10.83	8.12	7.73
May	27.63	28.79	15.06	23.71	12.20	15.67	20.77	14.71	15.46	14.35	13.95	13.90	16.54	13.71	9.94	7.48	9.70
June	37.21	28.87	16.54	23.47	11.47	15.52	18.94	14.88	16.09	14.40	13.60	13.52	16.39	13.31	9.39	6.89	9.97
July	36.00	29.00	19.13	24.21	11.00	15.92	17.23	16.00	16.46	15.42	13.48	13.13	16.60	13.08	9.25	6.46	11.27
Aug.	31.30	29.00	20.25	25.88	11.57	16.30	16.58	16.58	17.23	15.88	13.80	13.75	16.86	13.29	9.25	6.93	12.08
Sept.	31.50	29.00	18.87	26.53	12.15	18.33	16.98	17.20	17.42	16.25	13.92	14.75	16.60	13.70	9.12	7.69	11.35
Oct.	26.60	29.00	18.67	23.73	12.88	19.20	15.15	17.08	17.08	15.58	13.48	15.85	15.78	12.77	8.78	7.62	10.56
Nov.	27.83	28.50	20.50	20.00	12.73	18.02	15.13	18.17	17.63	15.25	13.18	15.97	14.15	11.28	8.61	7.45	9.94
Dec.	28.87	25.00	22.77	15.92	12.29	17.94	17.37	20.08	17.37	15.08	13.48	15.97	14.15	11.28	8.61	6.92	10.50
Aver.	*28.35*	*28.76*	*17.89*	*23.71*	*12.61*	*15.83*	*19.05*	*17.15*	*17.12*	*15.48*	*14.00*	*14.29*	*16.30*	*13.45*	*9.79*	*7.54*	*9.47*

Scrap Prices at Pittsburgh, Gross Ton

No. 1 Heavy Melting Steel

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$22.60	$30.00	$19.00	$26.30	$15.50	$14.30	$21.80	$21.38	$21.50	$18.63	$16.88	$15.10	$19.31	$16.69	$13.19	$10.22	$8.30
Feb.	21.75	30.00	14.75	27.75	16.00	14.00	23.25	20.88	19.50	17.50	16.13	14.94	18.63	16.81	12.88	10.25	8.50
March	23.25	30.00	14.00	27.25	14.00	15.13	25.38	19.38	18.50	17.55	16.55	14.81	18.44	16.56	12.80	10.25	8.88
April	28.00	28.50	15.20	26.00	12.63	16.38	25.88	16.20	17.00	16.63	16.50	15.31	18.60	15.95	12.39	10.12	10.00
May	28.80	28.50	14.75	25.00	13.30	17.30	22.80	15.63	16.75	15.69	15.40	15.25	17.88	15.25	11.25	9.60	11.75
June	41.00	28.62	17.12	25.00	12.69	17.00	21.13	16.00	17.30	15.75	14.81	14.56	18.25	15.13	10.30	8.75	11.75
July	39.00	29.00	19.70	26.00	12.00	17.38	18.10	17.50	18.00	16.81	15.00	14.10	18.55	14.75	10.56	8.25	12.72
Aug.	32.83	29.00	21.00	28.13	12.79	17.75	17.75	17.50	18.88	17.50	15.40	15.50	19.00	15.13	10.69	8.60	13.85
Sept.	33.25	29.00	19.20	29.00	13.63	20.13	17.88	18.10	18.70	17.88	15.50	16.56	18.31	15.60	10.65	9.54	12.94
Oct.	28.80	29.00	19.00	27.75	14.13	21.40	15.70	18.50	18.50	17.25	14.75	17.60	17.30	14.56	10.22	9.62	12.15
Nov.	29.50	28.87	22.25	23.50	14.30	20.50	16.13	19.63	19.50	17.20	14.25	17.19	16.39	13.19	10.22	9.15	11.50
Dec.	30.00	26.87	24.25	17.20	14.25	20.13	18.75	21.40	19.10	16.75	14.88	17.90	15.45	12.75	10.25	8.75	12.13
Aver.	*29.90*	*28.95*	*18.35*	*25.74*	*13.76*	*17.62*	*20.38*	*18.51*	*18.60*	*17.10*	*15.50*	*15.74*	*18.01*	*15.20*	*11.28*	*9.42*	*11.21*

Compressed Sheets

	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$17.63	$15.50	$14.15	$18.81	$16.39	$12.50	$9.56	$8.00
Feb.	16.13	15.06	14.06	18.31	16.19	12.56	9.56	8.13
March	15.60	15.45	14.56	18.25	15.75	12.55	9.70	8.44
April	15.25	15.56	14.94	18.55	15.60	11.94	9.50	9.50
May	14.75	14.40	14.90	17.81	15.06	10.88	8.95	11.15
June	14.60	13.75	14.25	18.13	14.81	9.75	8.12	11.50
July	15.50	14.31	13.60	18.25	14.65	10.06	7.50	12.19
Aug.	16.40	14.45	14.75	18.44	14.94	10.13	7.80	13.05
Sept.	16.50	14.50	16.39	18.19	14.95	10.35	9.25	12.63
Oct.	15.63	14.50	17.15	17.15	14.19	9.63	9.12	11.90
Nov.	16.00	13.70	17.00	16.13	12.81	9.75	8.65	11.25
Dec.	15.56	13.94	17.80	15.15	12.00	9.80	8.31	11.63
Aver.	*15.80*	*14.59*	*15.30*	*17.77*	*14.78*	*10.86*	*8.83*	*10.78*

Low-Phosphorus Scrap (Billet and Bloom Crops)

	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$24.00	$21.00	$18.50	$22.00	$20.88	$17.25	$13.00	$10.70
Feb.	22.25	20.25	18.50	22.00	21.25	18.00	13.00	10.50
March	22.00	20.30	18.50	22.50	21.50	18.00	13.00	10.50
April	21.13	21.00	18.50	23.45	21.40	17.50	13.00	11.00
May	20.00	20.00	18.60	22.50	19.88	15.00	12.40	13.80
June	20.00	19.25	19.00	22.25	19.13	14.10	10.87	14.00
July	20.75	19.00	19.00	22.45	19.20	14.50	10.50	15.00
Aug.	21.00	19.00	19.13	23.00	19.33	14.50	10.50	16.80
Sept.	21.67	20.00	19.88	22.39	20.00	14.30	10.50	15.75
Oct.	20.50	19.25	20.20	21.75	18.75	13.50	11.00	15.20
Nov.	20.60	18.30	20.50	21.13	17.13	13.00	11.50	15.00
Dec.	21.13	18.50	21.00	20.75	17.00	13.00	11.00	15.06
Aver.	*21.25*	*19.65*	*19.28*	*22.18*	*19.63*	*15.22*	*11.69*	*13.61*

Machine Shop Turnings

	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$14.30	$12.00	$10.80	$11.50	$11.50	$6.00	$6.50	$6.25
Feb.	13.63	11.38	10.88	11.50	11.39	6.44	6.50	6.25
March	13.35	12.00	10.25	10.63	10.94	7.65	6.75	6.25
April	12.00	12.63	10.44	11.15	10.90	7.06	6.56	6.81
May	11.00	11.30	10.20	11.06	10.19	6.57	6.00	8.30
June	11.00	10.50	9.00	11.63	9.56	6.50	5.12	8.38
July	11.38	11.50	9.10	11.90	8.60	6.75	4.75	9.50
Aug.	12.80	11.80	9.88	13.00	8.00	7.00	5.30	10.50
Sept.	13.06	11.63	11.13	12.06	8.00	7.30	6.00	10.00
Oct.	12.06	11.50	11.10	11.75	6.88	7.00	6.00	9.30
Nov.	11.90	11.10	11.00	11.00	6.00	6.94	6.00	7.75
Dec.	11.50	11.00	11.10	10.25	6.00	6.70	6.12	8.00
Aver.	*12.34*	*11.53*	*10.41*	*11.45*	*8.98*	*6.83*	*5.97*	*8.11*

Cast Iron Borings

	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$14.88	$12.50	$11.30	$12.88	$11.25	$7.50	$6.50	$5.50
Feb.	14.13	12.13	11.00	12.50	11.56	7.50	6.50	5.50
March	13.30	12.50	10.50	12.25	11.00	7.70	6.70	5.50
April	12.50	12.38	11.00	12.45	10.55	7.50	6.56	5.88
May	11.75	11.10	10.90	12.00	10.39	7.63	6.10	7.30
June	11.90	10.50	10.39	12.25	9.88	6.75	5.12	7.88
July	12.38	10.63	10.00	12.40	8.90	7.25	4.50	9.25
Aug.	12.75	11.00	10.75	12.75	8.50	7.56	5.30	9.95
Sept.	12.94	11.00	12.13	12.25	8.65	7.20	6.00	8.88
Oct.	12.50	11.00	12.50	12.25	8.00	7.25	6.00	8.20
Nov.	12.90	11.00	12.13	11.63	7.75	6.94	6.00	7.75
Dec.	12.13	11.13	12.00	10.75	7.40	6.70	5.50	7.50
Aver.	*12.84*	*11.57*	*11.22*	*12.20*	*9.49*	*7.29*	*5.89*	*7.42*

No. 1 Cast Cupola Scrap

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$30.00	$24.20	$32.00	$25.00	$16.30	$23.30	$21.00	$19.63	$17.50	$16.00	$14.50	$16.00	$14.00	$12.00	$9.50	$8.60
Feb.	30.00	18.75	34.00	22.75	16.00	24.75	21.38	20.13	17.00	15.56	14.50	15.00	14.00	12.00	9.50	8.50
March	30.00	18.00	34.00	21.20	15.94	26.75	20.25	18.60	17.00	15.80	14.50	15.13	14.00	12.00	9.20	8.50
April	29.00	19.00	33.00	18.00	16.88	27.75	18.50	17.75	16.50	16.00	14.50	15.39	14.00	12.00	9.00	8.75
May	28.50	17.20	32.00	18.00	18.50	26.30	17.88	17.50	16.50	15.70	14.50	15.50	14.00	10.75	8.90	9.90
June	28.62	18.50	32.00	16.63	18.75	24.13	17.25	17.10	15.90	15.13	14.25	15.50	14.00	10.00	8.50	10.00
July	29.00	20.40	40.20	16.00	19.00	21.10	17.80	17.00	15.75	15.00	14.25	15.50	13.00	10.00	8.87	10.63
Aug.	29.00	23.50	41.25	16.20	19.00	21.38	18.00	17.50	16.80	15.00	14.50	15.50	13.00	10.50	9.00	11.50
Sept.	29.00	23.50	42.00	16.88	22.13	21.75	18.00	17.40	16.50	15.00	14.94	15.50	13.00	10.10	9.50	11.50
Oct.	29.00	23.80	39.75	17.50	24.00	19.50	18.00	17.39	16.00	14.75	15.40	15.50	12.88	9.50	9.50	11.50
Nov.	29.00	27.25	34.25	17.10	23.13	18.63	18.13	18.00	16.30	14.35	15.00	15.13	12.13	9.50	9.10	11.00
Dec.	27.00	28.75	27.25	16.13	22.38	20.00	19.10	17.70	16.00	14.38	14.80	14.50	12.00	9.50	9.00	11.00
Aver.	*29.01*	*21.90*	*35.14*	*18.45*	*19.33*	*22.95*	*18.77*	*17.98*	*16.48*	*15.22*	*14.64*	*15.34*	*13.33*	*10.65*	*9.13*	*10.12*

Scrap Prices at Cincinnati, Net Ton

No. 1 Railroad Cast

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$17.38	$15.75	$14.00	$12.00	$13.73	$13.39	$10.80	$8.75	$7.05
Feb.	15.88	15.00	13.00	12.00	13.67	13.39	10.80	8.75	6.00
March	15.50	14.50	13.00	11.60	13.62	13.39	10.80	8.75	6.00
April	15.13	14.10	13.00	11.60	13.62	13.39	10.50	8.75	6.00
May	15.00	13.50	13.00	11.43	13.62	13.28	10.35	8.50	6.25
June	15.90	13.63	13.00	11.39	13.62	12.95	10.35	7.50	6.63
July	16.00	14.50	13.00	11.39	13.62	12.95	10.35	7.25	8.25
Aug.	15.63	14.75	13.00	11.39	13.62	12.95	10.35	7.00	9.00
Sept.	15.50	15.00	13.00	11.60	13.62	11.52	8.80	7.50	9.00
Oct.	15.00	14.30	12.50	12.60	13.57	11.15	7.98	7.75	9.00
Nov.	15.88	14.00	12.25	13.17	13.39	11.15	7.81	7.75	8.62
Dec.	16.00	14.00	12.00	13.35	13.39	10.80	7.81	7.75	8.69
Aver.	*15.73*	*14.42*	*12.90*	*11.96*	*13.59*	*12.53*	*9.73*	*8.00*	*7.54*

No. 1 Machinery Cast

	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$20.12	$19.75	$17.00	$14.30	$17.14	$16.52	$12.60	$10.00	$7.55
Feb.	19.12	19.39	16.00	14.30	17.24	16.52	12.60	10.00	6.50
March	18.35	19.00	16.00	13.85	17.19	16.52	12.60	10.00	6.50
April	17.75	17.80	16.00	13.85	17.19	16.52	11.90	10.00	6.50
May	17.75	17.00	15.60	13.65	17.19	15.85	11.25	10.00	6.75
June	18.15	17.00	15.50	13.60	17.19	15.63	11.25	8.50	7.13
July	18.25	17.00	15.50	13.55	17.19	15.63	11.25	8.00	8.75
Aug.	19.06	17.63	15.50	13.40	17.05	15.63	11.25	7.50	9.50
Sept.	19.25	18.00	15.50	14.20	16.96	13.48	9.45	8.00	9.50
Oct.	19.00	17.39	15.50	15.65	16.92	12.95	9.04	8.25	9.50
Nov.	20.12	17.00	14.50	16.70	16.57	12.95	8.93	8.25	9.12
Dec.	20.00	17.00	14.00	16.50	16.52	12.59	8.93	8.25	9.19
Aver.	*18.91*	*17.83*	*15.55*	*14.47*	*17.03*	*15.07*	*10.92*	*8.96*	*8.04*

Scrap Prices at Chicago, Gross Ton

No. 1 Heavy Melting Steel

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$21.12	$30.00	$17.40	$24.50	$15.13	$11.45	$19.15	$17.69	$19.44	$15.12	$13.25	$12.50	$15.39	$12.75	$10.27	$7.50	$5.25
Feb.	21.50	30.25	15.06	25.00	15.13	11.38	20.33	17.88	17.69	13.88	13.00	12.69	15.88	13.31	10.06	7.25	5.25
March	23.70	29.87	15.63	24.25	12.50	12.38	23.50	16.56	16.45	13.95	12.90	12.63	15.66	13.19	10.00	7.25	5.25
April	27.00	28.75	16.41	23.75	11.00	13.75	22.50	14.10	14.81	13.19	13.13	12.63	15.95	13.00	9.81	7.14	6.00
May	28.70	28.80	15.62	23.00	11.50	14.95	19.70	13.75	15.00	12.13	12.35	12.95	15.39	12.50	8.88	6.45	8.45
June	36.50	29.00	16.69	22.95	10.81	14.56	17.88	13.63	15.75	12.45	12.00	12.63	14.94	12.06	8.75	5.69	8.91
July	33.00	29.00	19.40	24.13	10.00	15.25	17.05	14.90	15.60	14.19	12.06	12.30	14.75	12.00	8.75	4.88	10.42
Aug.	29.60	29.00	20.88	25.35	10.60	15.95	16.00	15.50	16.44	14.00	12.30	12.75	15.06	12.13	8.38	5.75	10.46
Sept.	31.25	29.00	19.10	24.81	11.31	18.13	16.31	16.40	16.35	14.00	12.25	12.94	15.13	12.50	8.20	6.25	9.84
Oct.	26.00	29.00	18.25	21.50	12.44	18.40	14.15	16.13	16.00	13.00	11.69	13.95	14.30	11.38	8.00	6.00	9.47
Nov.	27.60	28.50	20.88	18.45	12.25	17.31	14.00	17.13	16.00	13.00	11.50	14.50	13.15	10.13	8.00	5.93	8.60
Dec.	28.37	22.75	21.80	16.20	11.13	17.25	16.06	18.95	15.75	13.00	12.06	14.55	12.50	10.00	7.80	5.25	8.94
Aver.	*27.86*	*28.66*	*18.09*	*22.82*	*11.98*	*15.06*	*18.05*	*16.05*	*16.27*	*13.49*	*12.39*	*13.09*	*14.84*	*12.08*	*8.91*	*6.28*	*8.07*

Steel Rerolling Rails

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$27.00	$35.00	$22.10	$34.25	$15.63	$12.10	$20.40	$18.88	$21.75	$17.50	$16.38	$14.90	$17.00	$14.63	$12.50	$10.50	$7.50
Feb.	27.00	35.00	16.44	34.38	15.50	12.00	21.75	20.13	19.25	16.63	15.94	15.00	17.50	15.00	12.00	10.50	7.50
March	28.00	34.75	16.38	32.30	13.30	13.31	24.63	19.13	17.86	16.50	15.60	14.44	17.50	15.00	12.00	9.85	7.50
April	32.62	33.50	17.55	32.13	12.63	14.50	23.75	16.30	16.00	16.13	16.00	13.81	17.50	15.00	11.75	9.00	7.88
May	36.50	34.00	17.75	31.75	13.40	15.70	21.70	15.00	16.88	15.19	15.20	14.40	17.50	14.81	10.69	8.30	9.30
June	46.90	34.00	18.75	32.65	12.94	15.25	19.25	14.81	17.85	15.45	14.75	14.81	17.50	14.63	8.40	7.31	9.63
July	45.19	34.00	25.15	35.00	12.25	16.13	18.00	15.50	17.44	17.19	14.88	14.75	17.50	14.50	10.39	6.63	11.32
Aug.	39.20	34.00	29.50	38.00	12.45	16.90	17.50	16.19	19.00	17.10	15.30	15.13	17.75	14.50	10.13	6.75	12.00
Sept.	39.75	34.00	26.80	38.13	13.13	19.38	17.38	17.30	19.25	17.39	15.19	15.88	17.81	14.40	10.00	7.19	11.38
Oct.	34.75	34.00	27.19	33.44	14.00	20.30	15.80	17.06	18.88	16.63	14.88	16.50	17.20	13.88	10.00	8.00	10.88
Nov.	34.80	33.50	31.25	22.90	13.80	18.38	15.06	18.19	19.44	16.50	14.50	16.63	15.50	12.50	10.25	8.00	9.90
Dec.	35.25	27.50	31.90	16.90	12.63	17.75	17.00	20.36	19.10	16.19	14.63	16.60	14.60	12.50	10.50	7.50	10.00
Aver.	*35.58*	*33.60*	*23.40*	*31.90*	*13.47*	*15.98*	*19.35*	*17.40*	*18.56*	*16.53*	*15.27*	*15.24*	*17.07*	*14.28*	*10.72*	*8.29*	*9.57*

Cast Iron Borings

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$10.08	$18.48	$12.54	$16.11	$10.92	$6.38	$15.57	$13.58	$15.56	$13.39	$10.06	$10.40	$12.50	$9.56	$5.06	$3.38	$3.00
Feb.	10.15	18.48	8.75	16.39	11.76	6.93	16.59	15.55	14.63	12.06	10.13	10.13	12.00	10.13	4.75	4.25	3.19
March	10.64	18.48	10.15	15.74	8.40	8.05	18.91	14.38	13.85	11.75	10.20	9.63	10.63	9.56	4.75	4.20	3.25
April	11.83	17.99	10.47	15.96	7.28	9.24	17.92	11.40	10.94	10.94	10.44	9.31	10.40	9.25	4.50	3.75	3.88
May	13.44	17.53	9.31	14.43	6.61	10.98	16.24	10.00	10.00	9.75	10.00	9.25	10.19	8.81	3.75	3.25	5.00
June	19.60	17.77	9.33	13.38	5.60	11.63	14.43	10.06	10.70	9.95	9.56	9.00	9.88	8.00	3.75	2.63	5.25
July	20.01	18.48	12.71	14.15	5.32	12.67	13.66	10.45	11.13	11.19	9.94	9.05	9.75	7.90	3.75	2.00	6.25
Aug.	18.36	18.48	14.28	15.06	5.38	12.88	12.04	10.69	12.75	11.45	10.50	9.31	10.19	7.75	3.94	3.05	6.50
Sept.	18.20	18.48	13.55	14.65	5.60	14.43	12.19	11.80	13.15	11.19	10.75	9.75	10.50	7.35	4.10	3.88	6.25
Oct.	15.75	18.48	11.63	12.88	6.44	14.90	10.42	11.56	12.75	8.88	10.13	10.75	10.00	5.75	4.00	3.88	5.88
Nov.	17.25	16.80	12.88	11.93	6.83	14.56	10.08	12.63	13.19	9.20	9.60	11.69	9.25	4.13	4.00	3.65	5.15
Dec.	18.05	14.84	14.17	10.98	6.09	14.56	12.04	14.36	13.50	9.50	10.19	11.85	9.15	4.90	3.60	3.06	5.50
Aver.	*15.28*	*17.94*	*11.65*	*14.30*	*7.19*	*11.43*	*14.17*	*12.21*	*12.68*	*10.77*	*10.13*	*10.01*	*10.37*	*7.76*	*4.16*	*3.41*	*4.93*

Steel Knuckles and Couplers

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$25.20	$37.52	$24.51	$27.44	$16.39	$12.77	$24.98	$21.21	$22.88	$18.00	$16.25	$14.65	$16.50	$16.00	$12.00	$8.25	$7.00
Feb.	25.20	36.89	19.32	29.68	16.11	12.39	26.53	21.77	21.00	17.13	16.00	14.50	17.00	16.00	12.00	8.25	7.00
March	26.60	35.00	19.60	27.66	13.55	14.12	28.71	20.00	18.70	16.70	15.60	14.06	17.00	15.88	11.80	7.95	7.00
April	30.67	34.00	19.21	26.32	12.47	15.68	27.93	17.40	17.63	16.44	15.69	13.81	17.30	15.25	10.56	7.63	6.75
May	33.71	34.00	17.36	25.48	13.66	16.69	25.42	17.00	17.63	15.39	14.80	14.50	17.13	14.31	9.75	6.70	9.40
June	43.83	34.00	18.20	25.20	13.16	15.89	22.55	16.63	19.00	15.30	14.25	14.25	16.75	13.75	9.75	5.63	9.50
July	45.92	34.00	20.50	27.16	11.63	17.92	21.00	17.20	18.19	17.39	14.25	13.75	16.75	13.50	9.75	5.50	10.63
Aug.	44.24	34.00	23.52	29.01	12.21	19.21	20.87	18.00	19.50	17.50	14.40	14.00	16.94	13.50	9.32	6.30	11.00
Sept.	40.88	34.00	21.95	27.72	13.03	21.84	21.56	19.35	19.50	17.39	14.00	14.75	17.00	13.50	9.00	7.00	10.75
Oct.	33.38	34.00	21.43	24.51	14.84	22.96	18.93	18.25	18.63	16.06	13.25	15.75	17.00	13.00	8.70	7.00	10.13
Nov.	33.04	34.00	23.39	20.83	14.28	21.84	17.64	19.63	18.75	15.50	13.00	16.00	16.39	12.13	8.50	7.00	9.30
Dec.	35.67	32.55	24.86	16.95	12.60	22.12	19.88	22.78	18.25	15.50	13.69	16.00	16.00	12.00	8.45	7.00	9.63
Aver.	*34.86*	*34.50*	*21.15*	*25.67*	*13.66*	*17.79*	*23.00*	*19.10*	*19.14*	*16.53*	*14.60*	*14.67*	*16.81*	*14.07*	*9.97*	*7.02*	*9.01*

Railroad Malleable Scrap

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$19.88	$30.02	$19.71	$32.48	$16.52	$12.77	$25.26	$20.93	$21.13	$18.00	$16.06	$13.60	$18.69	$16.39	$12.75	$7.00	$5.50
Feb.	19.39	30.02	16.65	33.53	17.36	12.81	26.75	21.77	20.00	17.56	16.06	13.50	19.39	17.13	11.94	7.00	5.50
March	20.10	31.24	18.07	31.92	15.46	13.87	28.56	21.00	19.10	17.60	16.00	12.63	19.39	16.88	11.70	6.65	5.63
April	22.81	31.64	17.70	30.95	13.59	15.68	28.00	19.30	17.50	17.39	15.88	12.75	19.35	16.55	11.13	6.38	6.75
May	26.10	32.82	17.08	29.68	14.11	16.80	25.54	18.13	17.63	16.50	14.45	13.00	18.56	15.75	10.25	6.00	9.35
June	35.41	33.04	17.92	28.73	12.88	16.73	24.08	16.88	18.00	16.60	13.50	12.69	17.81	13.94	9.55	5.19	9.75
July	33.73	33.28	20.94	30.24	12.53	17.51	22.51	17.00	17.88	17.81	13.63	12.50	16.85	13.50	9.00	4.63	10.25
Aug.	33.26	34.01	22.96	32.20	13.44	19.04	20.59	17.38	19.13	17.75	14.50	12.88	16.94	13.50	8.43	5.10	10.50
Sept.	34.44	34.01	21.22	30.95	14.63	23.67	21.71	18.20	19.10	17.39	13.69	14.39	17.00	13.50	7.50	6.75	9.75
Oct.	28.28	34.01	21.35	26.32	15.12	24.42	19.60	18.13	18.50	16.50	13.13	15.30	17.00	13.13	7.40	6.38	9.38
Nov.	28.67	32.68	25.89	21.78	14.67	23.11	18.91	19.00	19.19	16.50	12.55	15.88	16.39	12.69	7.25	5.50	8.70
Dec.	30.63	25.48	28.78	16.80	12.81	22.40	20.23	20.28	18.30	16.00	12.81	17.00	16.10	12.25	7.00	5.50	9.75
Aver.	*27.72*	*31.85*	*20.85*	*28.80*	*14.43*	*18.23*	*23.48*	*19.00*	*18.79*	*17.13*	*14.36*	*13.85*	*17.79*	*14.66*	*9.49*	*6.01*	*8.40*

Cast Iron Carwheels

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$18.87	$30.00	$25.90	$36.13	$21.00	$15.30	$26.70	$20.50	$21.38	$18.00	$15.31	$13.90	$14.13	$13.81	$11.00	$8.19	$7.55
Feb.	18.25	30.00	22.75	38.06	20.63	15.00	27.25	21.00	19.38	17.13	15.13	14.00	14.50	14.69	10.50	7.50	7.88
March	20.25	30.00	21.50	36.20	15.90	16.50	28.38	21.00	17.10	17.00	15.00	13.88	14.50	14.69	10.10	6.95	7.00
April	23.62	29.00	21.50	37.50	14.06	18.63	27.75	16.70	16.00	16.39	15.00	13.50	14.50	14.45	9.50	7.00	8.06
May	27.35	29.00	21.25	37.50	14.70	18.50	24.10	16.25	16.96	15.25	14.05	13.45	14.50	13.88	9.13	6.40	9.10
June	39.00	29.00	22.00	35.90	13.31	18.25	21.88	15.63	17.30	15.30	13.50	13.06	14.39	13.55	10.00	5.69	9.50
July	35.25	29.00	23.95	35.75	12.75	19.25	20.60	16.40	17.12	16.39	13.75	12.80	14.00	13.50	10.00	5.50	10.00
Aug.	30.40	29.00	26.25	38.35	12.95	20.60	19.50	17.13	17.50	15.90	14.50	12.75	14.00	13.50	9.75	6.30	10.50
Sept.	31.87	29.00	24.90	37.69	14.19	23.75	19.75	18.20	17.70	15.25	14.25	13.31	14.00	13.50	9.50	7.00	10.25
Oct.	25.75	29.00	24.88	36.06	16.50	25.10	17.90	17.63	17.38	14.50	13.56	13.85	14.00	13.13	9.30	7.00	9.88
Nov.	28.15	29.00	28.63	31.95	16.60	24.63	17.88	18.63	18.31	14.50	13.25	14.25	13.88	12.13	8.75	7.00	9.20
Dec.	31.00	26.75	31.10	24.40	15.75	24.00	19.75	20.70	18.30	14.50	13.44	14.10	13.60	11.75	8.50	7.00	9.50
Aver.	*27.48*	*29.06*	*24.55*	*35.46*	*15.70*	*19.96*	*22.62*	*18.31*	*17.79*	*15.84*	*14.23*	*13.57*	*14.17*	*13.55*	*9.67*	*6.79*	*9.04*

No. 1 Railroad Wrought, Net Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$23.50	$31.25	$19.10	$26.00	$13.63	$10.50	$17.75	$15.31	$17.44	$13.50	$12.50	$11.10	$13.63	$12.00	$8.50	$6.00	$4.40
Feb.	23.75	31.25	15.13	27.00	13.50	10.44	18.38	15.38	16.13	12.88	12.31	11.13	14.25	12.19	8.00	5.50	4.50
March	25.90	30.75	15.88	27.10	11.60	11.50	20.88	14.06	14.60	12.95	12.10	11.00	14.00	12.25	8.10	5.50	4.50
April	30.35	30.20	16.05	27.25	10.00	12.13	20.00	12.75	13.00	12.44	12.39	11.25	14.15	11.95	8.19	5.44	4.88
May	32.60	29.75	15.69	26.38	10.40	12.90	17.60	12.00	13.44	10.94	11.35	11.60	14.13	11.13	7.50	4.15	6.30
June	41.00	29.75	16.87	25.25	9.63	12.69	15.50	11.56	14.65	11.60	11.00	11.31	13.63	10.25	7.20	3.75	7.25
July	37.75	29.75	18.60	24.88	9.25	13.63	14.60	12.80	14.19	13.31	11.39	10.85	13.50	9.90	7.00	3.75	8.50
Aug.	33.70	29.75	20.75	24.75	10.45	14.75	14.25	13.75	16.00	13.50	11.70	11.06	13.88	9.75	7.00	4.20	9.00
Sept.	35.50	29.75	19.50	23.88	11.50	17.62	15.63	14.80	15.50	13.50	11.25	11.81	14.00	9.75	6.95	5.13	8.69
Oct.	28.75	30.36	19.38	20.25	13.00	17.75	13.20	14.25	14.38	12.81	10.19	12.60	13.70	9.19	6.75	4.63	8.12
Nov.	30.90	28.68	22.88	16.85	12.20	15.81	12.50	15.50	15.63	12.50	9.60	13.13	12.44	8.63	6.50	4.50	7.25
Dec.	31.25	24.62	24.10	14.60	10.44	15.13	15.00	16.81	13.95	12.00	10.44	13.25	12.00	8.50	6.50	4.12	7.69
Aver.	*31.25*	*29.66*	*18.66*	*23.68*	*11.30*	*13.74*	*16.27*	*14.08*	*14.91*	*12.66*	*11.35*	*11.67*	*13.30*	*10.46*	*7.35*	*4.72*	*6.76*

No. 1 Machinery Cast Scrap, Net Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$15.50	$25.90	$22.95	$37.25	$17.25	$12.90	$21.60	$20.38	$19.88	$17.00	$16.50	$14.50	$15.81	$13.50	$9.50	$7.75	$6.25
Feb.	15.37	26.06	20.00	38.88	18.00	13.25	23.63	21.00	18.75	17.00	16.50	14.50	16.25	13.75	9.50	7.50	6.25
March	16.90	27.25	21.63	37.85	14.90	14.13	26.25	20.13	18.20	17.00	16.50	14.50	16.00	13.75	9.50	7.20	6.25
April	20.43	27.12	21.45	37.25	13.25	14.88	25.75	18.40	17.25	16.39	16.50	14.13	16.00	13.50	9.39	7.00	7.06
May	23.20	26.70	20.12	37.38	13.60	16.20	23.30	17.38	16.88	15.88	15.80	14.00	15.39	12.88	9.00	6.50	8.45
June	30.00	27.12	20.75	36.30	12.75	16.06	21.75	16.75	17.50	16.15	14.50	13.88	14.75	12.50	9.00	6.13	8.75
July	29.25	28.06	23.30	36.50	12.25	17.00	19.60	16.90	17.50	17.19	14.50	13.50	14.50	12.00	9.00	6.00	10.63
Aug.	24.20	29.10	24.50	36.20	12.60	18.60	18.00	17.50	17.63	17.00	14.80	13.94	14.50	12.00	9.00	6.10	10.50
Sept.	23.75	30.00	24.20	34.00	13.44	21.38	19.63	18.20	17.90	16.88	14.56	14.81	14.50	11.40	8.50	6.25	10.00
Oct.	20.50	30.36	25.00	28.75	13.88	20.80	18.70	17.50	17.63	16.50	14.25	15.40	14.50	10.63	8.50	6.25	9.88
Nov.	22.00	28.87	28.12	23.00	13.50	20.25	18.38	17.88	18.19	16.00	13.50	15.50	13.63	9.36	8.50	6.25	8.60
Dec.	23.50	25.75	32.35	18.70	12.63	19.75	19.75	19.20	17.25	16.13	14.00	15.60	13.50	9.50	8.50	6.25	8.75
Aver.	*22.05*	*27.69*	*23.70*	*33.51*	*14.00*	*17.10*	*21.36*	*18.44*	*17.88*	*16.59*	*15.16*	*14.39*	*15.11*	*11.75*	*8.95*	*6.60*	*8.45*

Eastern Pennsylvania Scrap Prices, Gross Ton

No. 1 Heavy Melting Steel

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$21.70	$30.00	$17.20	$24.75	$14.50	$11.60	$19.70	$18.20	$18.50	$17.00	$15.39	$13.50	$16.39	$14.50	$10.50	$7.00	$6.75
Feb.	20.63	30.00	14.75	25.62	14.25	12.00	20.75	18.38	17.63	15.88	14.63	13.50	16.39	14.63	10.50	7.00	6.75
March	23.50	29.00	14.19	25.20	13.00	12.78	25.25	16.75	15.90	16.00	14.50	13.50	16.13	14.88	10.50	7.00	6.75
April	24.88	28.00	15.50	24.12	11.25	14.00	23.63	15.30	14.63	16.00	14.50	13.50	17.00	13.95	10.31	7.50	7.19
May	25.40	29.00	15.00	23.37	11.80	14.75	19.80	14.75	14.63	15.25	14.10	13.50	16.39	13.39	9.69	6.00	8.90
June	34.13	29.00	16.12	22.60	11.25	15.00	17.88	15.00	15.10	14.70	14.00	13.39	16.00	12.75	9.10	6.00	9.25
July	35.20	29.00	18.90	22.62	11.00	15.00	16.60	15.40	15.63	14.63	13.39	13.00	16.50	12.50	8.44	6.00	10.68
Aug.	31.88	29.00	19.37	25.00	11.40	15.20	16.00	16.75	16.38	16.20	13.70	13.00	16.50	12.63	8.69	6.30	11.95
Sept.	30.25	29.00	18.62	25.62	11.50	16.88	16.75	17.10	17.20	16.88	14.00	14.75	16.39	13.00	8.50	7.25	11.25
Oct.	25.00	29.00	19.10	22.75	12.06	17.80	15.40	16.63	16.75	16.50	14.00	16.00	15.70	12.38	8.13	7.25	10.20
Nov.	26.00	28.00	20.62	19.00	11.88	16.25	15.25	17.75	17.38	15.50	13.80	15.50	15.00	11.75	8.00	7.25	9.75
Dec.	28.20	25.00	22.50	15.25	11.50	16.38	16.75	20.10	17.50	15.50	13.50	15.40	14.50	11.10	7.75	6.75	10.44
Aver.	*27.23*	*28.67*	*17.66*	*22.99*	*12.12*	*14.80*	*18.65*	*16.84*	*16.44*	*15.84*	*14.13*	*14.05*	*16.07*	*13.12*	*9.18*	*6.77*	*9.16*

No. 1 Machinery Cast

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$20.20	$30.00	$23.80	$36.00	$23.25	$16.50	$23.20	$20.70	$20.13	$18.39	$17.00	$16.00	$16.31	$15.00	$12.00	$10.00	$8.00
Feb.	20.00	30.00	23.00	40.00	23.00	16.50	24.25	20.25	18.88	17.75	17.00	16.00	16.50	15.00	11.90	10.00	8.00
March	21.75	30.00	21.25	39.20	19.40	17.13	28.25	18.63	18.00	17.50	17.00	16.00	16.50	15.00	11.50	9.90	8.00
April	26.63	29.00	22.00	38.00	18.00	17.25	26.25	17.70	17.25	17.50	17.00	16.00	16.50	14.85	11.50	9.75	8.50
May	29.00	29.00	21.50	37.75	18.00	18.40	24.30	17.00	17.00	17.25	16.80	16.00	16.50	14.00	11.50	8.12	10.25
June	33.50	29.00	22.00	37.00	17.38	19.00	22.25	17.50	17.50	17.00	16.00	16.00	16.00	13.50	11.20	8.00	10.25
July	36.30	29.00	22.10	37.50	16.50	17.50	20.40	17.50	17.63	17.00	16.00	15.50	16.50	13.00	11.00	6.50	11.81
Aug.	33.25	29.00	24.75	39.00	17.00	18.60	20.38	17.88	18.00	17.70	16.00	15.50	16.50	13.00	11.00	8.20	12.50
Sept.	31.00	29.00	25.00	39.25	17.00	21.50	21.38	18.00	18.00	18.00	16.38	16.25	16.88	13.00	11.00	9.25	12.50
Oct.	28.00	29.00	25.20	38.75	17.13	22.60	19.50	17.50	18.00	17.39	16.50	17.10	16.00	13.00	11.00	9.50	11.50
Nov.	30.00	29.00	27.62	33.80	17.50	21.00	19.25	17.88	18.00	17.30	16.13	16.39	15.88	12.00	11.00	9.31	11.25
Dec.	30.60	29.00	30.75	24.50	16.63	20.25	20.25	19.50	18.13	17.00	16.00	16.25	15.00	12.00	10.10	8.00	11.81
Aver.	*28.35*	*29.25*	*24.08*	*36.73*	*18.49*	*18.85*	*22.47*	*18.34*	*18.04*	*17.48*	*16.48*	*16.08*	*16.28*	*13.61*	*11.23*	*8.88*	*10.36*

No. 1 Railroad Wrought

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$26.60	$35.00	$24.20	$33.50	$20.00	$14.50	$22.10	$20.90	$20.88	$18.39	$17.00	$15.25	$15.50	$15.00	$13.13	$9.00	$7.50
Feb.	25.50	35.00	21.50	36.00	19.75	14.63	24.75	21.50	20.13	17.75	17.00	15.06	16.00	15.00	12.00	8.50	7.50
March	30.75	35.00	20.25	35.90	17.20	15.38	27.50	19.00	18.90	17.20	17.00	14.60	16.00	15.00	12.00	8.50	7.50
April	36.00	35.00	21.60	35.00	17.00	15.88	27.00	18.10	17.75	17.50	16.50	14.50	16.00	15.00	11.25	9.00	7.62
May	41.40	34.00	21.00	33.50	15.20	16.90	24.20	16.63	17.50	17.25	16.50	14.50	16.00	15.00	11.00	7.19	10.75
June	51.25	34.00	21.50	33.00	14.38	17.00	22.50	16.50	18.10	16.60	16.00	13.75	16.00	15.00	10.20	7.00	10.75
July	50.60	34.00	24.40	33.00	13.50	17.13	18.80	17.70	17.63	16.50	15.75	13.50	16.00	15.00	10.00	7.00	11.06
Aug.	45.00	34.00	26.50	33.00	14.00	18.00	18.00	18.63	17.50	17.80	15.50	13.50	16.00	15.00	10.00	7.00	12.00
Sept.	44.00	34.00	26.50	33.25	15.00	20.88	18.50	19.00	17.70	17.88	15.50	14.50	16.00	15.00	10.00	7.50	12.00
Oct.	37.20	34.00	26.90	29.25	15.88	22.20	17.50	18.00	18.13	17.00	15.50	15.60	16.00	14.75	10.00	7.50	11.20
Nov.	35.00	34.00	28.37	25.00	16.00	19.00	17.38	18.38	18.50	17.00	15.30	16.00	15.88	13.75	10.00	7.50	11.00
Dec.	35.00	33.00	30.25	20.00	14.63	19.25	18.50	20.40	18.50	17.00	15.25	16.00	15.40	13.50	9.50	7.50	11.00
Aver.	*38.19*	*34.25*	*24.41*	*31.70*	*16.04*	*17.56*	*21.39*	*18.73*	*18.44*	*17.32*	*16.07*	*14.73*	*15.90*	*14.75*	*10.75*	*8.60*	*9.99*

Cast Iron Carwheels

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	$21.50	$30.00	$24.60	$36.00	$25.00	$16.50	$22.30	$20.10	$19.50	$18.13	$16.38	$15.50	$16.50	$15.00	$13.75	$10.75	$8.00
Feb.	20.50	30.00	23.00	40.63	24.00	15.00	24.75	20.38	18.38	17.50	16.00	15.50	16.50	15.00	13.50	10.00	8.00
March	21.50	30.00	23.00	42.40	18.50	15.94	26.50	18.75	18.50	17.50	16.00	15.50	16.50	15.00	13.40	9.70	8.00
April	25.75	29.00	23.10	40.00	18.00	15.88	26.50	17.50	17.75	17.50	16.00	15.50	16.50	15.00	12.63	10.00	8.75
May	28.00	29.00	21.00	40.00	16.80	24.20	17.00	17.00	17.00	17.25	16.00	15.50	16.39	14.88	12.25	8.94	9.75
June	34.00	29.00	22.00	38.00	18.00	17.13	22.75	17.00	17.00	17.00	15.38	15.50	16.00	14.50	12.00	8.25	10.25
July	36.20	29.00	23.20	38.50	16.50	17.50	20.40	17.30	17.25	17.00	15.00	15.50	16.39	14.50	12.00	7.00	12.00
Aug.	34.50	29.00	24.50	40.60	16.40	18.10	20.25	17.75	18.50	17.40	15.30	15.50	16.50	14.63	12.00	8.40	12.75
Sept.	32.50	29.00	24.50	42.75	17.00	21.75	21.00	18.00	18.50	17.50	15.50	15.88	16.50	15.00	12.00	9.50	12.00
Oct.	29.00	29.00	24.50	40.50	17.00	22.50	19.60	17.50	18.50	17.13	15.50	16.50	16.50	15.00	12.00	9.75	11.85
Nov.	31.25	29.00	27.75	36.40	17.20	20.50	17.75	17.88	18.50	16.60	15.50	16.50	15.75	14.38	12.00	9.31	10.75
Dec.	32.40	28.00	30.50	26.00	16.63	20.00	19.50	19.20	18.50	16.50	15.50	16.50	15.50	14.00	11.50	8.50	11.00
Aver.	*28.93*	*29.17*	*24.30*	*38.48*	*18.42*	*18.13*	*22.18*	*18.20*	*18.16*	*17.22*	*15.67*	*15.78*	*16.29*	*14.74*	*12.42*	*9.17*	*10.26*

Non-Ferrous Metals

Copper at New York, Cents a Pound (Lake Copper through 1919; Electrolytic Copper, 1920 to Date)

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ...	29.73	23.50	20.48	19.27	12.95	13.55	14.52	12.46	14.73	13.84	12.99	13.85	16.59	17.75	9.79	7.12	4.75
Feb. ...	34.90	23.50	17.86	19.02	12.84	12.92	15.34	12.73	14.49	14.00	12.69	13.82	17.74	17.75	9.71	6.07	4.75
March ..	35.85	23.50	15.46	18.50	12.19	12.68	16.84	13.52	14.06	13.86	13.08	13.90	21.25	17.75	9.88	5.76	5.00
April ...	31.67	23.50	15.55	19.19	12.49	12.61	16.81	13.21	13.30	13.69	12.81	14.13	19.69	15.67	9.48	5.54	5.39
May ...	31.42	23.50	16.18	19.05	12.79	13.13	15.54	12.76	13.34	13.60	12.65	14.19	17.75	12.76	8.67	5.25	6.68
June ...	32.46	23.50	17.95	19.00	12.88	13.62	14.74	12.35	13.41	13.64	12.37	14.50	17.75	12.09	8.05	5.11	7.75
July ...	28.78	25.80	22.07	19.00	12.46	13.71	14.39	12.39	13.95	13.91	12.51	14.50	17.75	11.02	7.67	5.04	8.63
Aug. ...	27.24	26.00	23.16	19.00	11.70	13.74	13.87	13.26	14.48	14.19	13.00	14.50	17.75	10.65	7.26	5.15	8.75
Sept. ...	24.90	26.00	22.68	18.70	12.01	13.75	13.36	12.97	14.42	14.05	12.93	14.70	17.75	10.39	6.98	5.95	8.75
Oct. ...	23.50	26.00	22.13	16.56	12.67	13.66	12.58	12.96	14.29	13.88	12.98	15.16	17.75	9.60	6.75	5.72	7.97
Nov. ...	23.50	26.00	20.69	14.63	13.07	13.62	12.76	13.59	14.36	13.59	13.34	15.75	17.75	10.17	6.54	5.07	7.91
Dec. ...	23.50	25.40	18.90	13.63	13.55	14.00	12.88	14.23	13.82	13.31	13.79	15.84	17.75	10.29	6.60	4.78	7.87
Aver...	*28.95*	*24.68*	*19.43*	*17.96*	*12.63*	*13.42*	*14.47*	*13.04*	*14.05*	*13.80*	*12.93*	*14.57*	*18.11*	*12.99*	*8.11*	*5.55*	*7.02*

Spelter (Zinc) at New York, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	6.59	18.19	9.94	7.88	7.38	9.62	5.83	5.06	7.28	6.78	8.10	8.75	7.03	6.00	6.70	5.59	4.37	3.38	3.38
Feb.	8.84	20.13	10.48	7.99	6.70	9.14	5.36	4.85	7.58	7.11	7.86	8.16	7.04	5.90	6.70	4.53	4.36	3.19	3.04
March	9.29	18.40	10.77	7.64	6.52	8.93	5.20	5.00	8.19	6.85	7.68	7.69	7.06	5.98	6.80	5.30	4.30	3.16	3.37
April	11.22	18.59	9.85	7.01	6.51	8.63	5.24	5.25	7.65	6.49	7.35	7.36	6.69	6.11	7.04	5.19	4.06	3.10	3.68
May	16.14	15.86	9.46	7.32	6.46	8.08	5.28	5.45	6.99	6.13	7.30	7.16	6.43	6.37	6.98	4.98	3.66	2.90	4.17
June	22.18	12.75	9.62	8.01	6.93	7.92	4.95	5.69	6.40	6.14	7.35	7.47	6.57	6.50	7.00	4.79	3.75	3.16	4.70
July	20.58	9.83	8.95	8.69	7.90	8.18	4.77	6.12	6.43	6.25	7.60	7.76	6.58	6.55	7.10	4.66	4.25	2.92	5.24
Aug.	14.11	8.98	8.69	8.96	7.84	8.31	4.69	6.59	6.68	6.53	7.55	7.69	6.70	6.59	7.15	4.72	4.17	3.13	5.28
Sept.	14.16	8.22	8.34	9.60	7.57	7.82	4.74	6.91	6.81	6.54	8.12	7.76	6.56	6.60	7.15	4.62	4.09	3.68	5.08
Oct.	13.96	9.98	8.24	9.11	7.83	7.51	5.10	7.20	6.66	6.67	8.65	7.66	6.35	6.60	7.09	4.40	3.73	3.41	5.12
Nov.	17.15	11.90	7.95	8.70	8.14	6.84	5.18	7.48	6.70	7.14	9.04	7.56	6.09	6.62	6.63	4.63	3.55	3.46	4.87
Dec.	16.69	11.13	7.84	8.45	8.59	6.00	5.25	7.46	6.60	7.73	8.97	7.39	6.15	6.70	6.09	4.43	3.50	3.50	4.85
Aver.	*14.24*	*13.66*	*9.18*	*8.28*	*7.36*	*8.08*	*5.13*	*6.09*	*7.00*	*6.70*	*7.96*	*7.70*	*6.60*	*6.39*	*6.87*	*4.82*	*3.98*	*3.25*	*4.40*

Lead, at New York, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	3.74	5.93	7.69	6.87	5.56	8.67	5.00	4.70	7.85	8.31	10.26	9.25	7.59	6.50	6.65	6.25	4.80	3.75	3.00
Feb.	3.82	6.23	9.13	7.04	5.05	8.88	4.54	4.70	8.14	9.01	9.38	9.08	7.40	6.34	6.85	6.24	4.55	3.72	3.00
March	4.04	7.43	9.47	7.24	5.23	9.21	4.08	4.71	8.47	9.23	8.90	8.46	7.57	6.00	7.41	5.66	4.53	3.15	3.15
April	4.20	7.73	9.43	6.95	5.03	8.95	4.33	5.13	8.19	8.19	8.01	7.91	7.10	6.10	7.19	5.58	4.42	3.00	3.27
May	4.25	7.45	11.00	6.88	5.05	8.55	4.99	5.51	7.39	7.27	8.08	7.75	6.60	6.13	7.00	5.51	3.82	3.00	3.65
June	5.89	6.87	11.68	7.55	5.34	8.48	4.56	5.73	7.14	7.08	8.35	8.08	6.42	6.30	7.00	5.41	3.92	2.99	4.17
July	5.59	6.34	10.72	8.04	5.65	8.67	4.40	5.75	6.28	7.15	8.33	8.60	6.33	6.22	6.80	5.25	4.40	2.73	4.46
Aug.	4.68	6.26	10.72	8.05	5.77	8.98	4.40	5.88	6.74	8.02	9.52	8.96	6.69	6.25	6.75	5.49	4.40	3.24	4.50
Sept.	4.62	6.88	8.84	8.05	6.12	8.11	4.60	6.20	7.06	8.09	9.60	8.80	6.30	6.45	6.88	5.50	4.40	3.47	4.50
Oct.	4.60	7.00	6.77	8.05	6.45	7.24	4.70	6.67	6.84	8.31	9.62	8.40	6.25	6.50	6.87	5.17	3.97	3.05	4.32
Nov.	5.16	7.13	6.44	8.05	6.76	6.33	4.70	7.20	6.87	8.96	9.84	8.00	6.27	6.39	6.29	5.10	3.94	3.04	4.29
Dec.	5.33	7.60	6.48	6.71	7.03	4.80	4.70	7.28	7.61	9.61	9.36	7.87	6.52	6.49	6.25	5.10	3.80	3.00	4.14
Aver.	*4.66*	*6.90*	*9.03*	*7.46*	*5.76*	*8.07*	*4.58*	*5.79*	*7.39*	*8.27*	*9.10*	*8.39*	*6.75*	*6.31*	*6.83*	*5.52*	*4.25*	*3.18*	*3.87*

Straits, Tin, at New York, Cents a Pound

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ...	44.10	85.13	71.50	62.74	35.94	32.03	39.16	48.70	58.26	62.20	66.43	55.56	49.21	38.84	26.03	21.80	22.70
Feb. ...	51.47	85.00	72.45	59.87	32.16	30.74	41.98	53.41	57.09	63.65	69.05	52.47	49.39	38.63	26.27	21.97	23.51
March ..	58.38	85.00	72.50	61.93	28.79	29.14	48.61	55.03	53.67	64.47	69.23	52.11	48.85	36.76	27.02	21.81	24.35
April ...	55.82	88.53	72.50	62.12	30.36	30.58	45.84	50.02	52.27	63.35	67.88	52.28	45.93	35.90	25.13	19.17	27.16
May ...	63.21	100.00	72.50	54.99	32.50	30.92	43.11	44.08	54.65	62.36	67.47	51.53	43.88	32.16	23.16	20.90	35.94
June ...	61.93	91.00	71.83	48.34	29.39	31.46	40.97	42.74	55.93	60.63	67.42	47.92	44.20	30.26	23.53	19.58	44.23
July ...	61.61	93.60	70.11	49.29	27.69	31.67	38.47	46.29	58.05	62.98	64.01	47.01	46.29	29.76	24.96	20.89	46.28
Aug. ...	62.53	91.33	62.20	47.60	26.35	32.36	39.33	41.89	58.12	65.17	64.41	47.97	46.60	30.00	25.73	22.98	44.71
Sept. ...	61.54	80.40	59.79	44.43	26.70	32.36	41.60	49.24	58.27	68.89	61.43	48.06	45.32	29.59	24.51	24.76	46.46
Oct. ...	62.24	78.82	54.82	40.47	27.70	34.61	41.80	50.60	62.24	70.36	58.49	48.99	42.25	26.76	22.72	23.91	47.95
Nov. ...	74.18	73.67	54.17	36.97	28.93	36.76	44.09	54.25	63.30	70.75	57.49	50.76	40.18	25.87	22.78	23.31	53.14
Dec. ...	84.74	71.51	53.80	34.04	32.41	37.48	47.16	56.03	62.94	68.68	58.54	50.23	39.87	25.01	21.28	22.70	53.04
Aver...	*61.90*	*85.28*	*65.68*	*50.23*	*29.91*	*32.51*	*42.68*	*50.19*	*57.90*	*64.29*	*64.32*	*50.39*	*45.16*	*31.63*	*24.43*	*21.98*	*39.12*

Aluminum (No. 1 Virgin, 98-99 Per Cent), at New York, Cents a Pound

	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan. ...	33.10	32.00	22.86	17.74	22.75	27.61	27.00	27.00	26.37	23.90	23.90	23.90	22.90	22.90	22.90
Feb. ...	32.26	31.83	24.50	17.33	23.25	27.71	27.00	27.00	25.83	23.90	23.90	23.90	22.90	22.90	22.90
March..	29.81	31.50	23.44	17.52	24.95	27.57	27.00	27.00	25.55	23.90	23.90	23.90	22.90	22.90	22.90
April ..	30.67	31.61	23.25	18.07	26.00	27.46	27.00	27.00	25.55	23.90	23.90	23.90	22.90	22.90	22.90
May ...	32.21	31.95	23.06	17.92	26.24	26.43	27.00	27.00	25.55	23.90	23.90	23.90	22.90	22.90	22.90
June ..	32.83	32.00	22.75	17.87	26.25	26.27	27.00	27.00	25.55	23.90	23.90	23.76	22.90	22.90	22.90
July ...	32.57	32.00	22.62	17.87	26.25	26.37	27.00	27.00	25.55	23.90	23.90	22.90	22.90	22.90	22.90
Aug. ...	32.23	32.21	20.22	17.87	26.07	26.52	27.00	27.00	25.55	23.90	23.90	22.90	22.90	22.90	22.90
Sept. ..	32.50	31.44	19.02	18.26	25.50	27.24	27.00	27.00	25.55	23.90	23.90	22.90	22.90	22.90	22.90
Oct. ...	32.50	29.12	17.85	20.32	25.50	27.16	27.24	27.00	25.29	23.90	23.90	22.90	22.90	22.90	22.90
Nov. ...	32.50	27.80	17.50	20.87	25.80	27.00	28.00	27.00	24.30	23.90	23.90	22.90	22.90	22.90	22.90
Dec. ...	32.48	23.83	17.50	22.52	26.31	27.00	28.00	26.85	24.26	23.90	23.90	22.90	22.90	22.90	22.90
Aver..	*32.14*	*30.61*	*21.21*	*18.68*	*25.41*	*27.03*	*27.19*	*26.99*	*25.41*	*23.90*	*23.90*	*23.39*	*22.90*	*22.90*	*22.90*

Production of Iron and Steel and of Commodities Made From Them

Steel Ingots Made in the United States

(THE IRON AGE *figures prior to June, 1917; American Iron and Steel Institute figures since then, with additions for electric and crucible steel)*

(Thousands of Gross Tons)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1899	801	718	822	796	874	862	4,873	856	932	917	950	980	951	*5,586	*10,459
1900	979	868	962	893	977	921	*5,600	798	775	685	712	698	727	4,395	9,995
1901	*1,009	968	*1,069	*1,085	*1,162	1,094	*6,388	1,136	1,159	1,079	*1,200	1,176	1,018	*6,768	*13,156
1902	*1,223	1,060	1,192	*1,256	*1,321	1,185	*7,237	1,189	1,211	1,209	1,268	1,174	1,268	*7,319	*14,556
1903	1,217	1,131	1,265	*1,322	*1,363	*1,376	*7,674	1,230	1,250	1,277	1,178	822	674	6,431	14,105
1904	759	1,020	1,239	1,325	1,263	1,100	6,706	885	1,001	1,153	1,196	1,262	1,327	6,824	13,530
1905	*1,516	1,389	*1,710	1,624	*1,735	1,576	*9,550	1,425	1,629	1,670	*1,746	*1,770	1,673	*9,913	*19,463
1906	*1,928	1,746	*2,018	1,848	1,956	1,833	*11,329	1,739	1,794	1,757	*2,047	2,029	1,929	11,295	*22,624
1907	2,005	1,830	1,949	2,007	*2,087	1,944	*11,822	1,975	2,046	1,899	*2,124	1,654	1,039	10,737	22,559
1908	934	954	1,057	1,023	1,004	972	5,944	1,049	1,171	1,263	1,401	1,350	1,499	7,733	13,677
1909	1,623	1,575	1,722	1,622	1,700	1,801	10,043	1,899	2,030	*2,225	*2,347	*2,376	*2,379	13,256	*23,299
1910	*2,404	2,257	*2,506	2,365	2,203	2,157	*13,892	1,904	2,016	1,956	1,929	1,818	1,639	11,262	*25,154
1911	1,716	1,788	2,199	2,001	1,918	1,801	11,423	1,682	1,951	1,992	2,050	2,015	1,916	11,606	23,029
1912	2,169	2,191	2,441	2,491	*2,648	2,461	*14,401	2,445	2,648	2,484	*2,833	2,759	2,715	*15,884	*30,285
1913	2,814	2,562	2,679	2,757	*2,841	2,532	*16,185	2,482	2,466	2,510	2,563	2,151	1,923	14,095	30,280
1914	1,907	1,881	2,287	2,285	2,039	1,930	12,329	1,907	1,944	1,895	1,799	1,470	1,476	10,491	22,820
1915	1,663	1,777	2,226	2,271	2,351	2,555	12,843	2,662	*2,887	*3,061	*3,246	*3,259	*3,326	*18,441	*31,284
1916	*3,333	3,321	*3,627	3,356	*3,652	3,473	*20,762	3,245	3,481	3,463	*3,672	3,581	3,198	20,640	*41,402
1917	*3,743	3,093	*3,864	3,792	*4,061	3,617	*22,170	3,447	3,663	3,486	3,932	3,714	3,207	21,449	*43,619
1918	2,641	2,725	3,728	3,791	3,939	3,696	20,520	3,732	3,696	3,832	4,017	3,668	3,586	*22,531	43,051
1919	3,651	3,178	3,128	2,631	2,266	2,607	17,461	2,947	3,226	2,718	2,046	2,513	2,784	16,234	33,695
1920	3,524	3,402	3,917	3,132	3,423	3,539	20,937	3,328	3,562	3,561	3,581	3,133	2,779	19,944	40,881
1921	2,517	1,999	1,795	1,387	1,446	1,146	10,290	918	1,300	1,342	1,847	1,897	1,630	8,934	19,224
1922	1,893	2,071	2,814	2,902	3,219	3,128	16,027	2,953	2,629	2,818	3,410	3,430	3,301	18,541	34,568
1923	3,841	3,472	*4,067	3,964	*4,216	3,767	*23,327	3,531	3,696	3,357	3,577	3,134	2,863	20,159	43,486
1924	3,650	3,826	4,207	3,348	2,640	2,066	19,737	1,878	2,553	2,828	3,125	3,121	3,569	17,074	36,811
1925	4,193	3,752	4,194	3,584	3,455	3,205	22,383	3,084	3,421	3,490	3,889	3,903	3,971	21,758	*44,141
1926	4,132	3,785	*4,469	4,106	3,928	3,734	*24,154	3,635	3,987	3,913	4,074	3,706	3,467	22,782	*46,936
1927	3,823	3,845	*4,575	4,163	4,083	3,526	24,015	3,232	3,529	3,298	3,345	3,155	3,203	19,762	43,777
1928	4,028	4,081	4,549	4,345	4,246	3,778	*25,027	3,841	4,217	4,186	*4,693	4,306	4,055	*25,298	*50,325
1929	4,545	4,372	*5,118	4,999	*5,339	4,951	*29,324	4,898	4,988	4,573	4,579	3,556	2,932	25,526	*54,850
1930	3,808	4,067	4,288	4,142	4,014	3,445	23,764	2,945	3,085	2,863	2,714	2,230	1,995	15,831	39,595
1931	2,534	2,570	3,083	2,794	2,574	2,149	15,704	1,907	1,733	1,560	1,605	1,607	1,313	9,725	25,429
1932	1,500	1,496	1,448	1,273	1,137	923	7,777	815	856	1,003	1,099	1,043	871	5,687	13,464
1933	1,030	1,087	910	1,363	2,002	2,598	8,989	3,204	2,901	2,311	2,112	1,541	†1,718	†13,786	†22,775

Asterisks denote high records. Figures for 1933 are preliminary and do not include electric and crucible ingots.
†Estimated as to December.

Daily Production of Steel Ingots in the United States, Gross Tons

	Jan.	Feb.	March	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1899	30,791	29,899	30,442	31,843	*32,376	*33,169	31,439	*34,246	*34,531	*35,254	*36,557	*37,680	*38,031	*36,039	*33,739
1900	36,244	36,173	35,648	35,732	36,180	35,422	35,899	31,929	28,719	27,394	26,384	26,831	29,071	28,356	32,139
1901	37,364	40,342	41,126	41,746	*43,051	*43,759	*41,213	43,702	42,939	43,174	*44,427	*45,235	40,699	*43,384	*42,303
1902	*45,284	44,164	*45,834	*48,321	*48,939	47,419	*46,693	45,735	46,569	46,497	46,974	46,961	48,760	*46,916	*46,805
1903	45,066	47,111	48,668	*50,857	*52,436	*52,906	*49,510	47,313	48,075	49,128	43,624	32,872	25,909	41,222	45,353
1904	29,186	40,817	45,863	50,973	48,567	42,309	42,985	35,416	37,057	44,339	45,985	48,542	51,064	43,744	43,364
1905	*58,298	57,860	*63,349	*64,980	64,248	60,624	*61,614	56,993	60,320	64,142	*67,174	*68,077	66,931	*63,954	*62,784
1906	*71,406	*72,758	*74,746	73,942	72,439	70,500	*72,626	69,491	66,501	70,295	*75,823	*78,023	77,151	*72,869	*72,747
1907	74,265	76,239	74,967	77,216	77,293	77,749	*76,272	75,950	75,774	75,971	*78,689	63,607	41,559	68,828	72,539
1908	34,617	38,153	40,675	39,342	38,605	37,375	38,105	40,342	45,034	48,561	51,903	53,997	57,654	49,568	43,839
1909	62,412	65,630	63,753	62,387	65,390	69,273	64,791	73,031	78,084	*85,576	*90,256	*91,398	*91,511	*84,976	*74,916
1910	*92,462	*94,024	92,804	90,097	84,720	82,977	*89,624	76,152	74,678	75,242	74,191	69,946	63,015	72,195	*80,881
1911	65,991	74,524	81,441	80,042	71,023	69,285	73,698	67,257	72,268	76,632	78,851	77,498	76,642	74,880	74,289
1912	80,320	87,650	93,879	*95,803	*98,066	*98,439	*92,310	94,057	98,060	*99,369	*104,927	*106,107	*108,610	*101,823	*97,066
1913	104,218	106,757	103,034	106,052	105,220	101,268	*104,419	95,468	94,839	96,543	94,927	86,051	73,954	90,362	*97,364
1914	70,630	78,348	87,972	87,887	78,410	74,239	79,539	73,350	74,759	72,889	66,626	58,786	56,794	67,251	73,376
1915	63,964	74,060	82,432	87,354	90,406	98,264	82,877	102,387	*111,023	*117,733	*124,839	*125,359	*127,946	*118,214	*100,592
1916	*128,195	*132,824	*134,334	134,239	*135,277	133,563	*133,089	129,780	128,943	133,184	*141,224	137,739	127,934	*133,162	*133,125
1917	138,629	128,891	*143,093	*151,665	150,400	139,129	*142,113	137,900	135,683	139,455	145,619	142,843	128,263	138,384	140,255
1918	97,822	113,539	143,370	145,815	145,910	147,814	132,322	143,520	136,875	*153,289	148,794	141,083	143,445	*144,430	138,425
1919	135,224	132,396	120,295	101,202	83,935	104,287	112,651	113,332	124,082	104,539	75,779	100,523	107,077	104,064	108,343
1920	130,519	141,739	145,073	120,480	131,661	136,114	134,213	127,992	137,016	136,976	137,726	120,496	106,874	127,846	131,030
1921	96,810	83,279	66,473	53,342	55,622	44,090	66,387	36,713	48,156	51,619	71,044	72,942	62,707	57,270	61,814
1922	72,764	86,324	104,247	116,090	119,215	120,299	103,401	118,112	97,380	108,395	131,164	131,935	132,017	119,621	111,511
1923	142,263	144,660	150,618	*158,549	156,161	144,894	*149,532	141,258	136,881	134,271	132,485	120,551	114,531	130,056	139,825
1924	135,182	153,050	*161,796	128,787	97,779	82,627	126,519	72,223	98,188	108,755	115,756	124,846	137,279	109,449	117,984
1925	155,307	156,348	161,321	137,834	132,883	123,248	144,407	118,634	131,577	134,214	144,030	156,116	152,728	139,472	*141,932
1926	158,931	157,710	*165,504	157,915	151,076	143,621	*155,831	139,807	153,347	150,515	156,713	142,529	133,339	146,039	*150,920
1927	147,039	160,222	*169,439	160,130	157,023	135,621	154,939	129,285	130,707	126,824	128,664	121,320	123,201	126,676	140,761
1928	154,913	163,231	168,475	*173,805	157,298	145,325	*160,429	153,629	156,192	167,447	*173,810	165,624	162,212	*163,209	*161,818
1929	168,323	*182,150	*196,861	192,273	*197,727	*198,062	*189,187	188,409	184,742	182,910	169,602	136,769	117,271	163,631	*176,368
1930	141,035	169,452	164,915	159,300	148,676	137,817	153,317	113,277	118,648	110,105	100,508	89,185	76,735	101,482	127,316
1931	93,852	107,083	118,577	107,462	99,346	82,654	101,162	73,346	66,654	60,000	59,444	61,800	50,500	61,577	81,369
1932	57,690	59,840	53,630	48,970	43,730	35,500	49,850	32,600	31,700	38,580	42,270	40,110	33,500	36,455	43,153
1933	39,618	45,286	33,699	54,514	74,148	99,904	57,995	128,152	107,430	88,884	81,225	59,265	†68,720	†88,950	†73,470

Asterisks show new high records.
Figures for 1933 do not include electric and crucible steel ingots.
†With December estimated.

Steel Castings Orders in the United States, Net Tons

(From United States Department of Commerce)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1920	80,663	85,326	125,952	99,201	97,652	85,795	574,589	78,858	76,932	78,267	56,757	49,668	42,368	382,850	957,439
1921	34,401	33,906	29,260	24,512	23,311	23,739	169,129	20,177	23,327	27,822	38,105	47,286	37,200	193,917	363,046
1922	43,230	46,520	60,080	94,920	97,350	112,120	454,220	83,010	79,560	122,840	94,980	76,400	86,420	543,210	997,430
1923	126,481	112,399	172,101	118,196	117,834	109,756	756,767	73,600	76,208	71,506	64,677	63,870	61,016	410,877	1,167,644
1924	69,872	91,502	126,986	93,518	79,988	68,019	529,885	54,538	50,321	76,005	83,221	91,388	115,605	471,078	1,000,963
1925	104,179	81,930	83,812	87,556	78,417	66,437	502,331	72,294	71,160	62,198	80,510	86,957	105,893	479,012	981,343
1926	112,322	101,495	113,770	91,549	84,451	73,785	577,363	79,798	71,325	69,740	77,836	73,477	90,143	462,319	1,039,682
1927	108,063	94,938	90,353	81,403	73,043	91,199	539,001	74,569	63,938	52,742	52,160	63,075	77,436	383,920	922,921
1928	91,448	91,076	83,755	84,086	86,796	72,107	509,268	66,992	81,286	82,762	78,860	84,742	96,318	490,960	1,000,228
1929	124,313	115,639	130,836	144,366	113,092	94,873	723,119	103,046	101,514	86,241	135,879	97,635	89,985	614,300	1,337,419
1930	101,500	114,419	122,462	92,987	91,077	61,164	583,609	57,850	50,370	49,542	45,552	48,123	49,387	300,824	884,433
1931	46,810	40,320	48,184	46,039	39,052	26,136	246,541	32,869	27,458	23,073	22,854	20,001	20,799	147,054	393,595
1932	17,344	17,010	16,588	12,801	11,342	12,765	87,850	9,301	10,147	11,883	11,853	13,235	13,283	69,702	157,552
1933	12,942	11,857	11,458	14,507	20,782	32,026	103,572	29,505	28,962	22,714	23,608	....	....	....	....

Pig Iron Production of the United States in Thousands of Gross Tons

(THE IRON AGE *figures, including ferroalloys made in blast furnaces, but excluding charcoal iron*)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1884	308	289	311	302	313	299	1,822	342	321	297	307	304	296	1,867	3,689
1885	278	275	313	297	302	286	1,751	308	305	294	315	333	382	1,937	3,688
1886	368	334	397	*428	*465	455	2,447	*473	460	448	*477	471	*497	*2,826	*5,273
1887	493	463	*522	513	454	359	2,804	413	486	*531	*569	550	548	*3,097	*5,901
1888	507	424	447	453	483	457	2,771	464	492	500	546	566	*616	*3,184	*5,955
1889	601	535	594	564	557	533	*3,384	562	566	564	*626	*642	*684	*3,644	*7,028
1890	*709	653	*734	713	*739	701	*4,249	712	703	706	*742	730	733	*4,326	*8,575
1891	612	492	481	429	512	607	3,133	731	728	726	*789	784	*812	*4,570	7,703
1892	784	745	792	736	732	690	4,479	690	651	635	700	717	747	4,140	*8,619
1893	728	665	754	739	755	674	4,315	564	407	322	326	373	431	2,423	6,738
1894	445	426	534	517	386	319	2,627	441	584	640	691	708	744	3,808	6,435
1895	706	617	672	648	668	679	3,990	776	*827	*845	*923	*926	*934	*5,231	*9,221
1896	873	779	810	785	799	751	4,797	721	608	491	499	550	647	3,516	8,313
1897	702	654	747	728	746	710	4,287	719	764	813	901	927	*986	5,110	*9,397
1898	974	895	*1,000	965	978	910	*5,722	924	915	907	974	985	*1,050	*5,755	*11,477
1899	1,033	906	1,022	1,034	*1,086	1,077	*6,158	*1,149	*1,159	1,145	*1,226	1,223	*1,276	*7,178	*13,336
1900	*1,285	1,158	1,264	1,226	1,282	1,215	*7,430	1,132	1,018	939	935	920	1,031	5,975	*13,405
1901	1,162	1,134	1,279	1,257	*1,339	1,318	*7,489	*1,360	1,336	1,300	*1,382	1,362	1,266	*8,006	*15,495
1902	*1,428	1,258	*1,445	*1,475	*1,543	1,447	*8,595	1,442	1,468	1,419	1,481	1,433	1,537	*8,780	*17,375
1903	1,473	1,391	*1,490	*1,608	*1,714	1,673	*9,449	1,546	1,571	1,554	1,426	1,039	847	7,983	17,432
1904	924	1,208	1,451	1,561	1,537	1,296	7,977	1,121	1,173	1,358	1,455	1,487	1,616	8,210	16,187
1905	*1,782	1,597	*1,936	1,922	*1,964	1,793	*10,994	1,742	1,844	1,899	*2,053	2,014	2,046	*11,598	*22,592
1906	*2,069	1,904	*2,165	2,073	2,097	1,977	*12,287	2,013	1,927	1,971	*2,197	2,188	*2,235	*12,531	*24,818
1907	2,206	2,045	2,226	2,219	*2,295	2,235	*13,226	2,256	2,250	2,184	*2,337	1,828	1,234	12,089	*25,315
1908	1,045	1,078	1,228	1,150	1,166	1,092	6,759	1,218	1,360	1,419	1,567	1,578	1,741	8,883	15,642
1909	1,798	1,707	1,836	1,739	1,883	1,931	10,894	2,103	2,249	*2,385	*2,600	2,547	*2,636	*14,520	*25,414
1910	2,609	2,397	2,618	2,484	2,390	2,265	*14,763	2,149	2,107	2,056	2,093	1,910	1,778	12,093	*26,856
1911	1,759	1,795	2,171	2,065	1,893	1,788	11,477	1,793	1,927	1,977	2,102	2,000	2,043	11,842	23,313
1912	2,058	2,101	2,405	2,375	2,513	2,441	13,893	2,411	2,512	2,464	*2,690	2,631	*2,782	*15,490	*29,383
1913	*2,795	2,586	2,764	2,753	*2,822	2,629	*16,349	2,561	2,546	2,506	2,546	2,233	1,984	14,376	*30,725
1914	1,885	1,888	2,348	2,270	2,093	1,918	12,402	1,958	1,995	1,883	1,778	1,518	1,516	10,648	23,050
1915	1,601	1,675	2,064	2,117	2,263	2,381	12,101	2,563	2,780	*2,853	*3,126	3,037	*3,203	*17,562	29,663
1916	3,185	3,087	*3,339	3,227	*3,361	3,211	*19,410	3,224	3,204	3,202	*3,509	3,312	3,178	*19,629	*39,039
1917	3,151	2,645	3,252	3,335	3,417	3,270	19,070	3,342	3,248	3,134	3,303	3,206	2,883	19,116	38,186
1918	2,412	2,319	3,213	3,288	3,447	3,324	18,003	3,421	3,389	3,418	3,487	3,354	3,434	20,503	38,506
1919	3,303	2,940	3,090	2,478	2,108	2,115	16,034	2,429	2,743	2,488	1,864	2,392	2,633	14,549	30,583
1920	3,015	2,979	3,376	2,739	2,986	3,044	18,139	3,067	3,147	3,129	3,293	2,935	2,704	18,275	36,414
1921	2,416	1,937	1,596	1,193	1,221	1,065	9,428	865	954	986	1,247	1,415	1,649	7,116	16,544
1922	1,645	1,630	2,036	2,072	2,306	2,361	12,050	2,405	1,816	2,034	2,639	2,849	3,087	14,830	26,880
1923	3,229	2,994	*3,524	*3,550	*3,868	3,676	*20,841	3,678	3,450	3,126	3,149	2,894	2,921	19,218	*40,059
1924	3,019	3,075	3,466	3,233	2,615	2,026	17,434	1,785	1,887	2,053	2,477	2,510	2,962	13,674	31,108
1925	3,370	3,214	3,564	3,259	2,931	2,674	19,012	2,664	2,705	2,726	3,023	3,023	3,250	17,391	36,403
1926	3,316	2,923	3,442	3,450	3,482	3,235	19,848	3,223	3,201	3,136	3,334	3,237	3,091	19,222	39,070
1927	3,104	2,941	3,483	3,422	3,391	3,090	19,431	2,951	2,947	2,775	2,784	2,648	2,696	16,801	36,232
1928	2,870	2,900	3,200	3,185	3,284	3,082	18,521	3,072	3,137	3,062	3,374	3,302	3,370	19,317	37,838
1929	3,442	3,206	3,714	3,663	*3,898	3,717	*21,621	3,785	3,756	3,498	3,588	3,181	2,837	20,665	*42,286
1930	2,827	2,839	3,246	3,182	3,233	2,934	18,261	2,639	2,524	2,277	2,165	1,867	1,666	13,139	31,399
1931	1,714	1,707	2,032	2,020	1,994	1,639	11,105	1,463	1,281	1,169	1,173	1,103	980	7,170	18,275
1932	972	964	967	852	783	628	5,168	572	520	592	644	631	546	3,518	8,686
1933	569	554	542	624	887	1,265	4,441	1,792	1,833	1,522	1,356	1,085	†1,169	†8,759	†13,200

*High records for periods specified.
†Estimated, as to December.

Daily Production of Pig Iron in the United States, Gross Tons

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1884	9,951	9,985	10,019	10,053	10,087	9,966	10,011	11,031	10,348	9,904	9,904	10,126	9,546	10,145	10,078
1885	8,965	9,825	10,106	9,891	9,742	9,527	9,673	9,924	9,855	9,787	10,148	11,113	12,319	10,525	10,103
1886	11,868	11,931	12,817	*14,257	*15,016	*15,159	*13,521	*15,265	14,845	14,910	*15,394	*15,685	*16,041	*15,357	*14,447
1887	15,918	*16,544	*16,826	*17,090	14,633	11,979	*15,489	13,320	15,685	*17,706	*18,346	18,329	17,678	*16,831	*16,167
1888	16,352	14,622	14,422	15,099	15,586	15,239	15,227	14,972	15,869	16,648	17,624	*18,866	*19,871	*17,303	*16,265
1889	19,384	19,124	19,147	18,802	17,980	17,774	*18,699	18,115	18,254	18,809	*20,203	*21,404	*22,053	*19,803	*19,256
1890	*22,888	*23,320	*23,687	*23,759	*23,816	23,380	*23,476	22,979	22,664	23,521	*23,942	*24,321	23,642	*23,507	*23,492
1891	19,747	17,590	15,512	14,301	16,518	20,226	17,312	23,571	23,465	24,194	*25,456	*26,139	*26,206	*24,834	21,104
1892	25,303	25,679	25,551	24,521	23,622	23,006	24,611	22,263	21,012	21,161	22,583	23,886	24,102	22,501	*23,550
1893	23,482	23,758	24,323	24,654	24,357	22,444	23,841	18,179	13,146	10,720	10,518	12,428	13,901	13,166	18,459
1894	14,350	15,203	17,246	17,229	12,450	10,639	14,515	14,221	18,826	21,339	22,284	23,604	24,011	20,695	17,630
1895	22,766	22,024	21,680	21,619	21,556	22,625	22,044	25,035	*26,661	28,151	*29,788	*30,862	30,143	*28,429	*25,263
1896	28,156	26,861	26,133	26,170	25,784	25,028	26,358	23,255	19,620	16,378	16,079	18,339	20,858	19,107	22,713
1897	22,629	23,375	24,108	24,270	24,063	23,655	23,685	23,210	24,634	27,089	29,071	*30,904	*31,815	27,774	*25,746
1898	31,427	*31,978	*32,262	32,152	31,530	30,334	*31,612	29,817	29,533	30,228	31,406	*32,829	*33,881	31,279	*31,444
1899	33,325	32,360	32,948	*34,464	*35,039	*35,899	*34,020	*37,065	*37,374	*38,156	*39,566	*40,782	*41,162	*39,012	*36,539
1900	*41,441	41,360	40,759	40,856	41,368	40,504	*41,047	36,507	32,839	31,322	30,167	30,678	33,239	32,474	*36,725
1901	37,498	40,487	41,274	*41,896	*43,206	*43,916	*41,377	43,859	43,090	43,329	*44,587	*45,398	40,845	*43,509	*42,452
1902	*46,054	44,915	*46,613	*49,182	*49,769	48,225	*47,488	46,512	47,360	47,287	47,772	47,763	49,589	*47,716	*47,603
1903	47,509	49,665	*51,305	*53,614	*55,278	*55,774	*52,205	49,877	50,681	51,791	45,989	34,654	27,313	43,386	*47,759
1904	29,795	41,668	46,820	52,039	49,580	43,191	43,831	36,155	37,830	45,261	46,944	49,554	52,129	44,616	44,226
1905	*57,479	57,048	*62,460	*64,068	63,346	59,773	*60,739	56,191	59,473	63,317	*66,231	*67,121	65,991	*63,039	*61,896
1906	66,739	*68,001	*69,859	69,107	67,701	65,891	*67,885	64,948	62,153	65,699	*70,865	*72,922	72,107	*68,103	*67,995
1907	71,149	*73,039	71,871	*73,975	*74,049	*74,486	*73,074	72,763	72,594	72,783	*75,386	60,939	39,815	65,701	*69,357
1908	33,718	37,163	39,619	38,320	37,603	36,404	37,139	39,294	43,865	47,300	50,555	52,595	56,158	48,277	42,739
1909	57,986	60,976	59,232	57,963	60,753	64,362	60,189	67,853	72,546	*79,507	*83,856	*84,917	*85,022	*78,915	*69,629
1910	84,149	*85,616	84,450	82,792	77,103	75,516	*81,565	69,305	67,963	68,539	67,520	63,659	57,349	65,719	*73,577
1911	56,752	64,090	70,039	68,839	61,079	59,586	63,376	57,839	62,150	65,903	67,811	66,648	65,912	64,357	63,870
1912	66,384	72,442	77,591	79,181	81,051	81,358	76,334	77,771	81,046	82,128	*86,772	*87,695	*89,766	*84,188	*80,283
1913	*90,172	*92,369	89,147	91,759	91,039	87,619	*90,325	82,601	82,121	83,531	82,139	74,453	63,987	78,129	*84,177
1914	60,808	67,453	75,739	75,665	67,506	63,926	68,519	63,150	64,363	62,753	57,361	50,611	48,896	57,868	63,150
1915	51,659	59,813	66,575	70,550	73,015	79,361	66,855	82,691	89,666	*95,085	*100,822	*101,244	*103,333	95,444	81,267
1916	102,746	*106,456	*107,667	107,592	*108,422	107,053	*106,651	104,017	103,346	106,746	*113,189	110,394	102,505	*106,684	*106,668
1917	101,643	94,473	104,882	111,165	110,239	109,002	105,359	107,820	104,772	104,465	106,550	106,859	92,997	103,892	104,619
1918	77,799	82,839	103,648	109,607	111,175	110,793	99,462	110,354	109,339	*113,942	112,482	111,802	110,762	*111,432	105,496
1919	106,525	105,006	99,685	82,607	68,002	70,495	88,584	78,339	88,496	82,932	60,115	79,745	84,944	79,071	83,788
1920	97,264	102,720	108,900	91,327	96,312	101,451	99,665	98,931	101,529	104,310	106,212	97,830	87,222	99,321	99,492
1921	77,945	69,187	51,468	39,768	39,394	35,494	52,089	27,889	30,780	32,850	40,215	47,183	53,196	38,671	45,325
1922	53,063	58,214	65,675	69,070	74,409	78,701	66,578	77,592	58,586	67,791	85,092	94,990	99,577	80,596	73,645
1923	104,181	106,939	113,673	*118,324	*124,764	122,548	*115,147	118,656	111,274	104,184	101,586	96,476	94,225	104,444	*109,713
1924	97,384	106,026	111,809	107,781	84,358	67,539	95,794	57,577	60,875	68,439	79,907	83,656	95,539	74,314	84,995
1925	108,720	114,791	114,975	108,632	94,542	89,115	105,039	85,936	87,241	90,878	97,528	100,767	104,853	94,519	99,831
1926	106,974	104,408	111,032	115,004	112,304	107,844	109,660	103,978	103,241	104,543	107,553	107,890	99,712	104,467	107,043
1927	100,123	105,024	112,366	114,074	109,385	102,988	107,351	95,199	95,073	92,498	89,810	88,279	86,960	91,313	99,266
1928	92,573	100,004	103,215	106,183	105,931	102,733	101,763	99,091	101,180	102,077	108,832	110,084	108,705	104,983	103,382
1929	111,044	114,507	119,822	122,087	*125,745	123,908	*119,562	122,100	121,151	116,585	115,745	106,047	91,513	112,307	*115,851
1930	91,209	101,390	104,715	106,062	104,283	97,804	100,891	85,146	81,417	75,890	69,831	62,237	53,732	71,401	86,025
1931	55,299	60,950	65,556	67,317	64,325	54,621	61,356	47,201	41,308	38,964	37,848	36,782	31,625	38,955	50,069
1932	31,380	33,251	31,201	28,430	25,276	20,935	28,412	18,461	17,115	19,753	20,800	21,042	17,615	19,117	23,733
1933	18,348	19,798	17,484	20,787	28,621	42,166	24,536	57,821	59,142	50,742	43,754	36,174	†37,710	†47,605	†36,140

*High records for periods specified.
†With December estimated.

Fabricated Structural Steel Orders in the United States, Net Tons

(From United States Department of Commerce Through 1932; 1933 Figures Computed by American Institute Steel Construction, Inc.)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1909	70,200	70,200	187,200	261,000	280,800	160,200	192,600	205,200	109,800	97,200	127,800	131,400	1,893,600
1910	159,360	128,640	167,640	153,600	192,000	205,440	101,760	115,200	78,720	76,800	63,360	90,240	1,532,160
1911	114,800	94,300	135,300	114,800	129,150	159,900	141,450	166,050	153,750	106,600	180,400	178,350	1,674,850
1912	154,070	169,260	147,560	128,030	219,170	160,580	154,070	175,770	141,050	199,640	138,880	145,390	1,933,470
1913	130,500	162,000	110,250	90,000	119,250	96,750	130,500	96,750	65,250	78,750	60,750	60,750	1,201,500
1914	140,740	143,010	172,520	199,760	129,390	127,120	154,360	63,560	86,260	79,450	45,400	79,450	1,421,020
1915	57,750	69,300	147,840	143,220	140,910	184,800	198,660	196,350	154,770	180,180	242,550	279,510	1,995,840
1916	164,220	178,500	242,760	173,740	190,400	138,040	114,240	152,320	126,140	183,260	185,640	204,680	2,053,940
1917	147,620	142,780	164,560	147,620	135,520	113,740	101,640	91,960	70,180	147,620	186,340	275,880	1,725,460
1918	136,740	144,480	121,260	165,120	154,800	144,480	299,280	147,060	154,800	110,940	69,660	74,820	1,723,440
1919	31,920	34,580	47,880	66,500	130,340	172,900	196,840	207,480	207,480	207,480	183,540	226,100	1,713,040
1920	207,000	262,200	231,840	187,680	171,120	138,000	138,000	110,400	118,680	71,760	74,520	71,760	1,782,960
1921	50,940	39,620	82,070	87,730	79,240	104,710	96,220	93,390	135,840	152,820	155,650	113,200	1,191,430
1922	121,600	133,760	234,080	258,400	240,160	221,920	206,720	206,720	194,560	176,320	152,000	185,440	2,331,680
1923	227,760	243,360	290,160	243,360	177,840	165,360	162,240	184,080	165,360	159,120	171,600	249,600	2,439,840
1924	224,940	228,200	221,680	208,640	192,340	208,640	224,940	195,600	211,900	211,900	270,580	247,760	2,647,120
1925	187,380	194,320	225,550	256,780	229,020	284,540	274,130	267,190	270,660	298,420	239,430	253,310	2,980,730
1926	208,800	208,800	234,000	252,000	266,400	262,800	248,400	284,400	216,000	223,200	223,200	259,200	2,894,400
1927	195,000	240,000	232,500	262,500	232,500	225,000	341,250	270,000	262,500	288,750	236,250	262,500	3,048,750
1928	207,900	265,650	257,950	234,850	308,000	296,450	296,450	354,200	319,550	257,950	242,550	246,400	3,287,900
1929	256,025	250,635	334,565	313,775	321,475	324,170	329,175	340,725	297,990	319,550	212,135	297,605	3,597,825
1930	238,800	267,600	236,800	222,800	297,200	253,600	270,000	252,000	155,600	209,200	151,200	152,800	2,707,600
1931	158,000	158,800	178,800	284,800	152,400	172,400	159,600	124,000	194,400	109,200	90,800	97,600	1,880,800
1932	48,400	62,000	64,400	64,800	99,800	86,800	67,200	78,800	111,200	74,400	51,600	143,600	955,000
1933	93,200	63,700	87,900	56,200	52,100	101,300	67,700	95,600	72,500	63,700	65,000	*79,900	*898,800

*With December estimated.

Bookings of Fabricated Steel Plate in the United States, Net Tons

(From United States Department of Commerce)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1923	64,832	61,797	75,065	59,850	40,081	62,736	364,361	62,510	40,990	42,945	38,598	31,846	28,806	245,695	610,056
1924	25,563	19,803	25,341	23,688	29,429	34,125	157,949	26,268	36,287	23,270	28,566	36,881	52,606	203,878	361,327
1925*	30,013	24,167	26,777	27,656	32,889	38,496	179,998	34,382	40,660	31,001	34,766	32,847	35,792	209,448	389,446
1926*	29,965	39,889	43,089	39,662	52,890	44,938	250,439	37,300	51,342	38,860	45,139	63,271	30,034	265,939	516,378
1927	36,043	59,843	55,675	47,611	38,063	28,936	266,171	35,609	48,780	38,863	47,296	27,524	35,877	233,949	500,120
1928	51,647	64,909	55,016	55,552	49,313	40,738	317,175	41,629	51,008	43,499	59,836	62,914	52,204	311,090	628,265
1929	40,570	70,314	69,344	54,246	58,293	57,975	350,739	58,456	51,590	51,842	45,661	52,642	27,742	287,936	638,675
1930	57,083	34,662	46,137	45,454	38,328	41,774	263,439	38,283	36,513	41,066	30,197	33,151	26,787	205,996	469,435
1931	27,518	24,438	31,056	29,916	26,210	22,806	161,944	27,261	24,282	33,473	20,839	18,268	16,442	140,565	302,509
1932	17,613	17,755	12,564	14,074	17,888	18,383	98,277	12,485	11,916	11,109	16,737	7,873	9,510	69,630	167,907
1933	11,128	16,588	8,903	9,502	16,243	37,020	99,384	20,058	16,320	16,025	17,839	....	....	.....	.....

*During these years additional plants were added to those reporting monthly tonnages.

Steel Sheets Produced by Independent Makers, Net Tons

(From National Association of Flat-Rolled Steel Manufacturers)
(Hot-Rolled Annealed, Galvanized and Full-Finished)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1919	132,796	127,168	110,339	112,720	108,739	119,363	115,324	129,861	102,035	79,872	128,617	143,405	1,410,239
1920	185,271	177,410	198,606	165,811	161,645	166,819	142,023	188,458	198,467	202,703	185,450	85,204	2,057,867
1921	37,011	45,520	74,239	85,592	106,969	83,374	49,096	94,900	106,454	131,577	127,983	82,198	1,024,913
1922	86,130	122,439	166,244	184,979	218,739	210,464	179,100	228,398	202,600	243,476	242,562	205,239	2,290,370
1923	260,520	237,919	279,475	251,808	260,006	218,432	174,910	234,112	185,577	225,714	188,144	155,299	2,671,916
1924	274,097	275,118	278,767	234,000	176,582	114,807	144,291	190,436	217,981	247,222	224,931	259,794	2,638,026
1925	317,424	283,290	290,308	280,082	260,470	266,290	246,404	270,212	295,810	348,714	336,021	326,960	3,521,985
1926	328,643	299,553	319,132	294,811	264,541	268,448	239,764	293,703	307,459	314,598	278,455	238,345	3,447,452
1927	256,856	282,171	359,340	316,100	309,360	300,706	237,243	266,645	220,919	245,765	232,041	260,130	3,285,276
1928	316,541	330,565	366,127	327,909	349,367	311,629	267,684	329,396	318,907	369,243	358,402	302,182	3,947,952
1929	391,404	326,468	364,202	375,256	393,430	337,841	323,905	366,734	302,490	319,660	204,071	181,916	3,887,377
1930	291,529	275,952	259,658	308,988	274,220	205,675	186,206	173,956	179,928	193,934	148,550	145,125	2,643,721
1931	167,865	192,218	224,323	213,608	201,846	147,843	174,890	123,752	116,842	122,739	102,758	101,570	1,890,254
1932	118,921	124,157	110,559	101,559	96,180	85,232	60,956	57,417	89,817	108,111	90,679	77,489	1,121,077
1933	85,337	91,723	64,724	111,942	139,696	166,272	188,143	203,893	180,304	146,106	102,585	.....	.....

Shipments of Steel Barrels in the United States, Number

(From United States Department of Commerce)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1921	120,903	125,789	140,382	191,155	137,862	137,766	148,852	239,263	180,172	255,229	200,306	190,778	2,068,457
1922	178,432	203,060	336,952	400,428	450,744	533,888	441,984	488,542	412,896	378,966	388,139	402,639	4,616,670
1923	457,824	431,093	565,718	544,722	520,978	461,251	468,047	482,504	365,580	393,496	343,471	321,440	5,356,124
1924	303,668	362,725	394,756	420,129	425,397	382,550	407,258	398,312	389,064	441,851	389,230	407,474	4,722,414
1925	415,040	407,781	510,928	605,424	569,670	508,880	506,894	495,736	503,221	555,981	498,070	474,742	6,052,364
1926	469,432	518,104	622,312	608,056	582,352	624,082	593,611	511,542	508,548	497,031	505,383	546,392	6,586,845
1927	525,518	503,183	568,821	609,090	575,712	605,123	576,602	610,454	525,374	572,893	497,345	454,638	6,624,754
1928	474,159	514,362	644,521	661,949	694,843	717,496	645,881	675,600	595,640	661,009	568,353	549,913	7,403,726
1929	548,581	563,532	743,407	775,481	834,432	779,567	782,411	809,860	655,314	638,681	567,257	619,058	8,317,581
1930	643,120	599,324	785,951	766,617	736,147	638,358	621,091	552,265	565,204	619,558	500,409	406,327	7,434,371
1931	427,622	449,485	554,332	600,566	618,801	549,781	581,450	455,502	452,960	492,145	444,201	385,435	6,012,280
1932	352,135	369,882	453,621	452,191	432,455	654,561	353,336	360,509	398,241	417,470	376,647	307,372	4,928,420
1933	292,609	272,432	371,945	402,506	467,695	568,437	552,923	470,632	524,719	789,474	582,299	.....	.....

Malleable Castings Produced in the United States, Net Tons

(From United States Department of Commerce)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1923	....	....	....	....	76,818	75,810	.....	68,306	80,030	71,654	74,724	63,057	58,488	416,259	.....
1924	75,550	77,203	80,600	66,923	57,583	39,985	397,844	36,562	40,188	45,105	54,638	51,862	63,523	291,878	689,722
1925	71,188	64,825	65,889	67,608	65,714	63,343	398,567	61,727	61,042	62,798	73,195	65,248	70,622	394,632	793,199
1926	66,776	71,161	80,116	72,241	65,106	66,358	421,758	60,384	62,218	63,399	62,321	50,946	55,561	354,829	776,587
1927	56,627	62,335	72,205	64,612	62,747	64,310	382,836	53,046	57,096	50,807	52,458	46,698	53,824	313,929	696,765
1928	61,072	65,359	70,070	63,380	67,903	67,090	394,874	60,290	68,606	62,665	70,054	63,560	59,428	384,603	779,477
1929	73,125	73,875	83,365	83,744	81,641	72,232	467,982	70,600	69,173	59,087	65,526	46,459	46,029	356,874	824,856
1930	61,381	65,942	63,464	61,984	53,502	39,347	345,620	30,911	25,614	26,785	28,785	27,114	30,431	169,383	515,003
1931	31,665	34,076	35,758	36,682	31,964	24,248	194,393	20,223	18,821	18,485	20,444	17,984	21,503	117,460	311,853
1932	20,399	19,834	17,844	15,461	16,597	15,018	105,153	9,447	6,804	10,051	12,274	13,622	14,128	66,326	171,479
1933	12,638	13,780	9,959	18,566	24,628	31,118	110,689	30,865	31,811	27,078	24,381	....	....	.....	.....

Figures prior to June, 1923, not available.

Automobiles Produced in the United States and Canada

(Cars and Trucks)

(From United States Census Bureau and Dominion Bureau of Statistics)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total—United States and Canada
1923	256,019	290,130	374,600	395,086	414,256	395,025	343,726	358,572	337,337	375,864	323,675	316,260	4,180,450
1924	330,177	384,320	400,658	392,249	332,221	263,507	279,538	291,009	304,321	302,180	241,654	215,952	3,737,786
1925	251,247	296,158	390,247	452,851	439,195	413,944	410,987	269,199	338,532	457,094	383,021	325,325	4,427,800
1926	324,477	382,490	455,841	460,838	450,101	408,020	374,818	442,136	416,433	349,091	266,129	175,287	4,505,661
1927	254,284	323,390	417,763	430,993	431,356	343,025	280,383	322,520	271,572	227,430	140,987	136,677	3,580,380
1928	240,191	336,300	430,783	434,315	459,725	425,195	417,312	492,543	436,507	415,820	268,909	243,541	4,601,141
1929	422,538	497,705	626,076	663,811	636,250	567,424	518,301	512,842	429,729	394,540	226,997	125,502	5,621,715
1930	283,610	345,961	417,118	468,281	444,699	349,596	275,721	234,160	228,606	158,942	142,161	161,323	3,510,178
1931	178,344	229,811	289,398	354,098	329,901	257,475	222,710	191,741	143,212	81,582	70,114	123,973	2,472,359
1932	123,075	122,895	127,277	155,136	192,516	190,218	116,615	94,392	86,492	51,625	61,761	109,492	1,431,494
1933	133,402	110,123	124,581	188,922	227,699	260,645	239,628	242,566	201,890	142,167	66,195	†110,182	†2,048,000

In no year prior to 1922 did total United States production reach 2,200,000 units.
†With December estimated.

Railroad Freight Cars and Locomotives Ordered in the United States

(From Railway Age)

	Freight Cars	Locomotives		Freight Cars	Locomotives		Freight Cars	Locomotives
1915	109,792	1,612	1922	180,154	2,600	1929	111,218	1,212
1916	170,054	2,910	1923	94,471	1,944	1930	46,360	440
1917	79,367	2,704	1924	143,728	1,413	1931	10,880	235
1918	114,113	2,593	1925	92,816	1,055	1932	1,968	12
1919	22,062	214	1926	67,029	1,301	1933	*1,964	*34
1920	84,207	1,998	1927	72,006	734			
1921	23,346	239	1928	51,200	603			

*December estimated.

Production of Steel Trackwork in the United States

(For T-rail track of 60 lb. and heavier)

(From American Iron and Steel Institute, in Net Tons)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1925	11,096	14,392	17,965	16,792	17,075	17,416	94,736	13,858	12,982	11,373	12,689	12,281	13,475	76,658	171,394
1926	15,247	16,158	19,756	19,547	19,196	18,762	108,666	15,635	15,203	15,159	15,568	12,225	14,549	87,339	196,005
1927	12,969	13,678	19,216	17,081	16,768	14,557	94,269	13,217	13,387	10,999	9,914	9,706	9,139	66,362	160,631
1928	9,332	11,371	15,058	13,511	14,139	13,718	77,129	11,776	11,039	10,768	9,493	8,379	11,061	62,516	139,645
1929	10,344	12,180	14,927	16,815	16,332	14,839	85,437	13,844	14,818	12,962	12,902	11,326	10,826	76,678	162,115
1930	11,830	12,524	13,096	13,508	12,779	10,553	74,290	8,774	6,812	5,642	5,192	4,212	5,174	35,806	110,116
1931	5,626	6,321	8,944	8,564	7,453	5,705	42,613	4,409	3,924	3,472	2,162	1,948	2,373	18,288	60,901
1932	2,936	2,765	3,229	3,340	3,061	1,975	17,306	1,890	1,797	1,430	1,245	1,765	1,845	9,972	27,278
1933	1,984	1,822	2,013	1,662	1,768	2,471	11,720	2,982	3,425	3,845	3,006	3,087	....	.....	.....

Unfilled Orders, United States Steel Corpn.

(End of month, in thousands of gross tons)

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	3,111	5,380	7,827	4,614	4,249	7,923	11,474	9,478	6,684	9,285	7,573	4,242	6,911	4,798	5,037	4,883	3,800	4,276	4,109	4,469	4,132	2,648	1,899
Feb.	3,401	5,454	7,657	5,026	4,345	8,569	11,577	9,288	6,011	9,502	6,934	4,141	7,284	4,913	5,285	4,617	3,597	4,398	4,144	4,480	3,965	2,546	1,854
March	3,447	5,305	7,469	4,654	4,256	9,331	11,712	9,056	5,431	9,892	6,285	4,494	7,403	4,783	4,864	4,380	3,553	4,335	4,411	4,571	3,995	2,472	1,841
April	3,219	5,665	6,979	4,277	4,162	9,830	12,183	8,742	4,801	10,360	5,845	5,097	7,289	4,208	4,447	3,868	3,456	3,872	4,428	4,354	3,898	2,327	1,865
May	3,113	5,751	6,324	3,998	4,265	9,938	11,887	8,338	4,282	10,940	5,482	5,254	6,981	3,628	4,050	3,649	3,051	3,417	4,304	4,059	3,620	2,177	1,930
June	3,361	5,807	5,807	4,033	4,678	9,640	11,383	8,919	4,893	10,979	5,118	5,636	6,386	3,263	3,710	3,479	3,053	3,637	4,257	3,968	3,479	2,035	2,107
July	3,584	5,957	5,399	4,159	4,929	9,594	10,844	8,884	5,579	11,118	4,830	5,776	5,911	3,187	3,539	3,603	3,142	3,571	4,088	4,022	3,405	1,966	2,020
Aug.	3,696	6,163	5,223	4,213	4,908	9,660	10,407	8,759	6.109	10,805	4,532	5,950	5,415	3,290	3,513	3,542	3,196	3,624	3,658	3,580	3,169	1,970	1,890
Sept.	3,611	6,552	5,004	3,788	5,318	9,523	9,833	8,298	6,285	10,375	4,561	6,692	5,036	3,474	3,717	3,594	3,148	3,698	3,903	3,424	3,145	1,985	1,776
Oct.	3,694	7,594	4,514	3,461	6,165	10,015	9,010	8,353	6,473	9,837	4,287	6,902	4,673	3,525	4,109	3,684	3,341	3,751	4,087	3,482	3,119	1,997	*
Nov.	4,142	7,853	4,396	3,325	7,189	11,059	8,897	8,125	7,128	9,021	4,251	6,840	4,369	4,032	4,582	3,807	3,454	3,673	4,125	3,640	2,934	1,968	....
Dec.	5,085	7,932	4,282	3,837	7,806	11,547	9,382	7,379	8,265	8,148	4,268	6,746	4,445	4,817	5,033	3,961	3,973	3,977	4,417	3,944	2,735	1,968	....
Ave.	*3,655*	*6,284*	*5,907*	*4,115*	*5,189*	*9,719*	*10,716*	*8,635*	*5,995*	*10,022*	*5,331*	*5,648*	*6,009*	*3,993*	*4,324*	*3,922*	*3,397*	*3,852*	*4,161*	*4,034*	*3,466*	*2,172*	*1,909*

*Publication discontinued and steel shipments issued thereafter.

Monthly Shipments of Steel Products by United States Steel Corpn., Net Tons

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	*Total
1930	1,104,168	1,141,912	1,240,171	1,188,456	1,203,916	984,739	946,745	947,402	867,282	784,646	676,016	579,098	11,624,294
1931	800,031	762,522	907,251	878,558	764,178	653,104	593,900	573,372	486,928	476,032	435,697	351,211	7,676,744
1932	426,271	413,001	388,579	395,091	338,202	324,746	272,448	291,688	316,019	310,007	275,594	227,576	3,974,062
1933	285,138	275,929	256,793	335,321	455,302	603,937	701,322	668,155	575,161	572,897	430,358	.....	.....

*Less yearly adjustment.

Shipments of Lake Superior Iron Ore by Water, Gross Tons

(Reported by the Lake Superior Iron Ore Association)

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Shipments	42,623,572	54,081,298	58,537,855	51,107,136	53,980,874	65,204,600	46,582,982	23,467,786	3,567,985	21,623,898

Labor Under the NRA—New Deal or New Illusion?

(Continued from Page 39)

goods industries and allied service occupations. Relief can come only when investments are resumed on something like a normal scale, and such resumption depends on a restoration of confidence.

The Illusion of Overproduction

The collapse of business activity during the depression created the illusion of overproduction and surplus capacity. It is only natural when purchasing power is suddenly depressed and plants are shut down that there should seem to be too much of everything. We are only commencing to learn that we can consume more only when we produce more and that we can employ more only when we increase our capacity to produce.

But progress toward a revival of production cannot be made too rapidly. Increases in wage rates that are out of proportion to gains in output are bound to halt the procession. If organized labor does not yet appreciate this fact, officials of the NRA do. In his Philadelphia address on Dec. 2, General Johnson declared that "a flat 30-hr. week with increased payrolls (organized labor's favorite demand) would bankrupt and throw out of production so many companies that resulting unemployment would shock the country."

"Organization to the Ultimate"

Yet there continues to be much loose talk about "industrial democracy," "united action of labor and management," "self-government of industry," and the like. In a public address General Johnson said that the fundamental idea of the Recovery Act is "organization to the ultimate" for both industry and labor.

Apparently the Administration envisions a parliament of industry in which, on the one hand, groups of employers will legislate on matters of trade and, on the other hand, groups of employers and employees will legislate on wages and working conditions. In line with this idea union leaders are demanding that labor boards be set up for each code and that one-half of the membership be drawn from the ranks of union organizations.

Soviet Experience

But neither "industrial democracy" nor "self-government of industry" can be reconciled with planned economy. In the early days of the Soviet Republic labor enjoyed a maximum of self-rule, electing shop committees to which managements were answerable. This system so crippled production that Moscow abolished the committees and replaced them with "red" dictators who were supposed to look out for the interests of the working class and check any moves toward sabotage on the part of the managerial staff.

Even the dictators have "gummed up" production and as a result are steadily being shorn of power so that management can function more efficiently. At the same time the workmen themselves, who have been notorious in their unwillingness to stay "put," making labor turnover a major problem of Soviet industry, have been prohibited from moving from one job to another without a labor passport containing the written release of the previous employer.

And thus it has come about that in the land where the proletariat rules, labor has less freedom than anywhere else in the civilized world.

What Organization Accomplished in Italy

In Italy, also, planned economy has resulted in centralization of authority at the expense of both labor and industry. Theoretically, like the NRA plan, Fascism provides for collective bargaining in employer-employee relations and for self-government in industrial and trade groups. In practice, however, both labor and industry have been bereft of all freedom. The parallel organization of employers and employees in the different branches of Italian trade and industry is as thorough as anything yet contemplated by proponents of the NRA program, but final authority in all cases rests with Rome.

The Fascist labor charter, according to the National Industrial Conference Board, prohibits strikes or lockouts and stipulates that all disputes which cannot be settled by negotiations between trade unions and trade associations be submitted to courts of appeal, functioning as labor courts, whose decisions are final. The Government may at any time refuse or revoke the right of collective bargaining if it regards such action in the interests of the State. Workers who infringe discipline or commit any acts that impede the normal operation of an enterprise may be punished by fines, suspension from work or immediate discharge.

The Proof of the Pudding

"The proof of the pudding is in the eating thereof." Have wage rates in Italy risen? On the contrary, the

(Continued on Page 168)

(*Concluded from Page* 167)

Fascist State has resorted to compulsory reductions of wage rates, as well as wholesale and retail prices, in order to adjust domestic costs to the high value at which the lira was stabilized in 1927.

Trade associations likewise are under rigid State control in Italy. Election and appointment of officers are subject to Government approval, which may be revoked at any time. In addition, the State may dissolve the boards of directors of associations and transfer their powers to executive officers for a period of one year, and in emergencies may appoint a commissioner to direct the affairs of an association.

At the head of all confederations of employers and employees is a National Council of Corporations, the chairman of which is Mussolini. This council controls all subsidiary bodies from the standpoint of national interests, preventing one industry, trade or labor group from gaining an advantage at the expense of another. The council's task, says the Conference Board, is really one of coordinating and harmonizing the activities of the individual confederations, with a view to reconciling the various economic interests of Italy. The head of the Government has the right of absolute veto. No rule of the council can become effective without his consent.

There is no half-way point in national planning, whether it be in Italy, Russia or America. No centralized planning body will voluntarily tolerate maladjustments or disturbances which upset economic balance. Group freedom, no less than individual freedom, is inconsistent with a planned economy. Under such a system, labor organizations cannot hope to win special advantages through collective bargaining. All moves of both labor organizations and industrial associations will be conditioned by public policy as determined at the national capital.

It is highly significant of the trend in that direction that the new National Emergency Council at Washington is not only charged with enforcing the provisions of codes under the NRA and the A.A.A. but also with protecting consumers' interests. Heretofore the "partnership" of labor and management has been stressed as the chief end of the recovery program, but with the growing public dissatisfaction with rising prices the power of the consumer is now being felt. Obviously a scheme of national planning must guard the public at large from exploitation at the hands of either labor or industry.

Labor thinks it has won new freedom. As a matter of fact, it has sold itself into bondage. Freedom in bargaining and national planning don't mix.

Mechanical Power Transmission During 1933

(*Concluded from Page* 91)

was introduced during this period. It not only meets these requirements, but is ideally adapted for general power transmission service, particularly where dust, grit, and explosive vapors exist. This clutch is of the single, double and triple friction plate design with the driving plate so constructed as to be self centering and free to float when clutch is in disengaged position. Provision has been made which allows this plate to expand and contract from excessive heat and still operate quietly. Powerful self-locking toggle mechanism allows easy and positive engagement and disengagement.

Curved tooth spiral bevel gears have supplanted during the past few years straight bevels in most all drives operating at high speeds and wherever quietness and smoothness are desired. Probably the latest development in this type of gearing is what is known as the "Hypoid" gear. This gear has an advantage over spiral bevel gears in that it permits transmission of power between offset shafts as comparatively illustrated by Fig. 12. In the Hypoid pair the gear is cut as a bevel gear but the pinion is cut in an offset position corresponding to the position in which it is run when in mesh with its mate. It is through this method of pinion generation that correct mesh of the Hypoid pair is obtained. The Hypoid gear is extremely valuable for the driving of batteries of machines at right angles to the driving shaft, because it allows the driving shaft to be continuous.

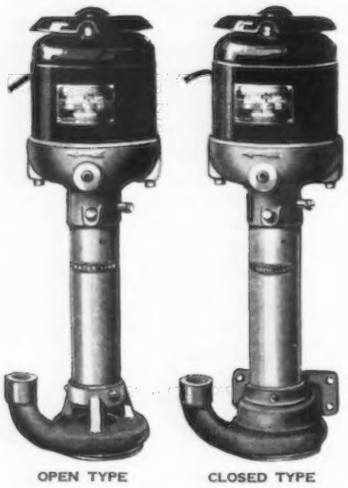
The use of anti-friction bearings is constantly increasing based on their power and maintenance economy. The employment of this type of bearing is almost universal where heavy loads are encountered, where lubrication costs are important and where continuous operation is essential. There are, however, many light power drives where anti-friction bearings are essential, but their higher cost has been difficult to justify. In view of this, 1933 saw the introduction of an inexpensive self aligning ball bearing pillow block possessing the essential characteristics necessary for light power service. The new and unique feature of this bearing is that the housing is of heavy gage pressed steel formed to insure extreme rigidity and is of two piece construction. The use of steel instead of cast iron for the housing permits smaller overall dimensions, therefore many situations can be accommodated where the larger overall dimensions of the cast iron housing would preclude the use of the anti-friction bearing.

NOT A BAD IDEA!

TO USE

a "BROWNIE" PUMP

NO PACKINGS TO LEAK
NO SCREENS TO CLOG
AND BALL BEARINGS
WITHIN ONE INCH OF THE
IMPELLER. WRITE FOR
FURTHER INFORMATION.



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WHY PAY THE PRICE OF INDIFFERENCE?

"I'M TELLING YOU... *THEY EXPECT MIRACLES"*

HAVING "reject" trouble? Many plants are. Factory after factory long sobbing over sales are amazed to find that the first business upswing leaves them sobbing over production.

Possibly machines are obsolete . . . workmen not in tempo . . . organization lacking. On the other hand, it may be something simpler, though just as costly. Possibly your plant, too, is merely paying the price of indifference toward Motor Control.

Motor Control can easily disrupt production because it is the one link between human intelligence and motorized machines. It has a bearing on the speed and dependability of production, the quality of workmanship, the cost of power and maintenance, the safety of men, motors and machines.

If your plant has come to judge the importance of Motor Control by its cost or size rather than by its function, act now to prevent further losses. Ask C-H engineers to survey your operations. Specify Cutler-Hammer Motor Control for all new motors or motorized machines. Motor builders recommend Cutler-Hammer. Leading machinery builders feature it. Electrical wholesalers stock C-H Motor Control and Safety Switches for your convenience. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus,* 1325 St. Paul Ave., Milwaukee, Wis.

Now is the Time to Know

As the business curve rises, economies made now will swell to amazing totals. If your plant is sacrificing profits, is inclined to doubt the savings possible in modernizing Motor Control, make a test case of one machine or one department as an object lesson. Call in a C-H engineer. Judge only by results.

NRA

CUTLER HAMMER

The Control Equipment Good Electric Motors Deserve

(A-8019)

A Survey of the Metal-Working Industry

(Continued from Page 33)

agance in government spending—national, state, county, and city—with high taxes that must follow.

From a manufacturer of wood working machinery, and grey iron castings.

* * *

Code Delays

Our industry code not being signed as yet with certain other codes being in operation.

From a manufacturer of steel tanks for oil, industrial and farm use.

* * *

Delay in getting codes signed.

From a manufacturer of steel products.

* * *

Lack of Farm Buying Power

The financial condition of farmers.

From a manufacturer of warm air furnaces.

* * *

Decreased purchasing power of the farmer, and also increased indebtedness they have, and large amount they now owe manufacturers such as ourselves.

From a manufacturer of grain threshers, combine harvesters, and attachments.

* * *

Foreign Competition

Foreign made goods—metal particularly.

From a manufacturer of hand agricultural implements.

* * *

Lack of demand for pig iron and the continued and increasing imports of foreign pig iron.

From a manufacturer of pig iron.

* * *

In addition to the foregoing specific comments:

47 Manufacturers believed low volumes, lack of demand for capital goods, and overcapacity constituted the most serious problems.

10 Manufacturers chose the subject of labor relations as the most important.

11 Stated that lack of credit or financing was their principal drawback.

5 Emphasized the difficulty of increasing prices to meet increasing costs.

9 Believed lack of confidence in Administration policies to be our greatest handicap.

8 Manufacturers listed "dollar uncertainty" as the chief obstacle.

7 Said that their most serious problems revolved about price cutting or unfair trade practices.

3 Manufacturers said that the restoration of farmer buying power was most important in their cases.

Other Comment By Metal-Working Executives, of Interest to the Industry

THOSE to whom our questionnaire was addressed were invited to comment freely upon matters which they considered of interest to the industry at this time, not necessarily related to the specific questions listed. A number of these comments are given below:

Volume Not Price Increases Needed

Our code still has a chance to be supplemented by a lot of foolish rules. As it is now it is fairly simple.

Our present need is volume, not price increase.

From a manufacturer of automobile chassis springs, trailer axles, etc.

* * *

Two Years Before Conditions Improve

Before the building industry can improve to any extent, it will probably require two or three years of steady improvement in general business conditions.

From a manufacturer of passenger and freight elevators.

* * *

Enforcement of Code Found This Company Unprotected

Enforcement of code setting minimum wages did not give us sufficient time to protect ourselves as we had 60 to 90 days volume sold ahead. The company has to absorb the increased labor costs. We actually had ten days notice of last minute change made in wage rates from those as originally submitted and recommended by our association.

From a manufacturer of special screw machine products.

* * *

Delay in Codes Hurts

Delay in codes has hurt terribly.

From a manufacturer of radiators, boilers, bath tubs, sinks, etc.

* * *

Lack of Confidence May Prove Fatal

There is at present a lack of confidence and a hesitancy that may prove fatal if not soon overcome.

From a manufacturer of pressed metal stampings.

* * *

Sees Danger in Price Fixing

The fixing of absolutely equal prices from all producers must result inevitably in

a. Improper sales "expenses," entertainment, etc.
b. Oppression of small units in any industry.
c. Decreased total employment—higher prices to the consumer, with competition hamstrung.

From a manufacturer of steel forgings to standardized specifications.

* * *

A Small Jobbing Foundry Reports

We operate a small foundry on jobbing work and other items including sash weights. We find competition in this line very keen and prices not stable nor sufficiently high to cover present day costs. (The foundry business here is very poor.) We also operate a retail farm implement and supply business. This line is somewhat brighter since advance in price of milk, etc.

From a manufacturer of gratings, stanchions, plowshares and sash weights.

* * *

Satisfying Demand This Manufacturer's Problem

"This condition is general," says this manufacturer, quoting a newspaper item from a local paper, whose headline reads "CWA Work Hindered by Tool Shortage," "We are running our forge 16 hours (two shifts) daily, and our heat treating department 24 hours daily (three shifts)."

From a manufacturer of forged hand tools.

Increased Farm Purchasing Would Help Materially

We assume your question No. 3 implies direct purchase of products by agricultural producers. Indirectly an increased purchasing power would have quite appreciable effect on trade in this territory, which would reflect itself in every business.

From a manufacturer of structural steel, ornamental iron, gray iron castings.

* * *

Codes Should Consider Small Town

Codes do not take into consideration small towns—minimum rates and definition of executives. $35.00 is either too high for small town or too low for city.

From a manufacturer of hand lift trucks, skid platforms, special machinery.

* * *

Until money stabilization demagoguery is silenced we cannot see the slightest improvement.

From a manufacturer of power transmission machinery.

* * *

Allow Manufacturer "In Red" to Set Own Hours and Wages

We think the small manufacturer who has been operating under a loss should be allowed to set his own office hours for employees under $35 per week and weekly hours for foremen up to 56 hours in the case of the latter.

From a manufacturer of grinding wheels.

* * *

Code Means Red Ink

After being in the red for nearly three years we operated at a slight profit in August, September, October and November, but now that our code is in effect we will be back in the red again, even though our sales volume does

(*Continued on Page* 172)

ONE OF

Nickel Silver's Hardest Workouts

OCCURS IN THE OPTICAL INDUSTRY

IN these modern times, when the utmost in service and the utmost in grace must be incorporated into one and the same pair of spectacles, the Nickel Silver base supplied to the optical manufacturer must have an exceedingly high coefficient of workability if it is to measure up under the severe fabrication required.

Nickel Silver wire for spectacle frames, for instance, which is of small diameter in the beginning, has to be swedged, bent, flattened, rolled, wound and then engraved. In face of all this, the finished frame is expected to have extreme resiliency and strength, and it does!

In the manufacture of spectacle temples, a rod of Nickel Silver 1 1/3″ in diameter and 12″ long, encased in pure gold, is drawn to a length of TWO MILES! The result is a gold-filled wire of 12/1000″ diameter. A flaw the size of a pin point in the original rod would elongate to a length of *three yards*. No place for anything but quality here!

The ability of Seymour Nickel Silver to meet the exacting demands of spectacle manufacture is the reason why it has been the choice of a large part of the optical industry for many years. If you require a silver-white alloy of fine ductility, capable of extreme resiliency, we should like to send you samples of Seymour Nickel Silver for test purposes.

FOR SERVICE

THE SEYMOUR MANUFACTURING CO., 50 FRANKLIN STREET, SEYMOUR, CONN.

SEYMOUR

SHEETS, WIRE, RODS

NICKEL SILVER

ALSO: PHOSPHOR BRONZE SHEETS, WIRE, RODS : AND NICKEL ANODES

(Continued from Page 170)
not decrease as it looks as though it would.

From a manufacturer of cut gears and kindred parts.

* * *

Trouble With Navy Contracts

We are working on U. S. Navy contracts, taken before NRA came into being, and although we have had to increase our cost (both labor and materials) we cannot get additional compensation from the Navy Department unless we file statement that we are financially unable to complete contract. If we were to do this they would be justified in cancelling other contracts taken at a later date.

From a manufacturer of aluminum products for Ordnance Department of Navy, etc.

* * *

Says Code Demands Practices Condemned in 1929

The history of the bolt, nut, and rivet industry is an excellent illustration of the workings of the Sherman Anti-Trust law and the doctrine that "competition is the life of trade." You have all the details of the formation of its institute in 1923-24 and the final indictment in 1929. Now we are asked to sign a code which compels us to do the very things for which we were indicted.

From a manufacturer of bolts, nuts, forgings, and screw machine products.

* * *

Spend NRA Profits on Machine Replacements

We believe that if the NRA operations lead to profits on the part of manufacturers, and a portion of these profits is allocated to the replacement of obsolescent machinery, it will lead to a permanent betterment of the manufacturing industry.

From a manufacturer of looms for all woven products, accessories, parts.

* * *

Fears Monopoly from Large Competitor

In our particular line of business our great problem today seems to be one of our largest competitors, who, through unfair methods, is trying to monopolize the little business there is, having become a factor in the hardware lines only in the past three years.

From a manufacturer of cut tacks and small cut nails.

* * *

Government Has Gone Too Far in Regulating Industry

It has been our opinion that the government is going too far in regulation of industry. Each industry has problems peculiarly its own. No blanket regulation can fit all. If the government had gone after the concerns that were bad like the sweat shops and the like, all right. The bulk of industry is honest and treated its men right. Competition was bad in some lines and could have been arranged by allowing industry to meet and arrange fair selling prices subject to the supervision of the government, and then the government should punish concerns that did not live up to the agreement. With fair prices better wages would be paid. We find our men want more hours of work.

From a manufacturer of screw machine products.

* * *

For Orthodox Money

We feel a more orthodox monetary policy and a less generous dispersal of public money would restore confidence and allow business to proceed faster.

From a manufacturer of metal products to customers' specifications.

* * *

Says American Business Cannot Be Driven

With all due respect to some of the splendid accomplishments of the NRA, American business cannot be driven, and when the NRA heads became drivers instead of leaders, the entire program ceased to inspire and from that moment its success became a matter of serious doubt. The President and his efforts must be recognized even by those of us who did not vote for him, as sincere. His courage is inspiring and to him all are looking for something better. It seems to me that regular weekly talks by him directly to the people, even if brief, but telling what had been accomplished and what the next step is, would do a lot to inspire the masses and at the same time inspire those under him to make a better record themselves and thus confidence would be increased and progress made.

A bull market, even if it has to be started by artificial means, will do more to restore confidence and establish values and start spending than anything else that has been tried. Better have ten years of prosperity and five of depression than no prosperity at all.

From a manufacturer of brake beams and railroad car parts and metal stampings.

* * *

Cut Political Offices by 50 Per Cent

We recommended a petition to vote at next elections that 50 per cent of all present political officials or offices be abolished and that the remaining 50 per cent of occupants be investigated and ousted for graft, racketeering, banditry. The money saved would pay all costs of taking care of depressions and save increasing taxation and enhance social advancement.

From a manufacturer of printing presses, paper slitting and rewinding machinery, etc.

* * *

Employees Benefit Under NRA

Our experience under the NRA fixing a more equitable price for oil and for lumber, together with the restriction within our plant to forty hours a week, has benefited our men materially. While some men received a decreased pay check, still we raised their rates averaging 15 per cent and increased by 51 per cent the number of employees. We are hoping for cooperation of all classes to give NRA a chance and play square.

From a manufacturer of high carbon rope wire and wire rope.

* * *

The Experiments of "Educated Jackasses"

There is too much experimenting without much practical knowledge, controlled by those who have never made much of a success of their own lives and without experience to operate the codes as set up by the industry. Most of them are educated jackasses, theorists, and whichever way the country goes they will always be in the same position.

From a structural steel manufacturer and warehouse operator.

* * *

Needs Flexibility in Working Hours in Order to Show Profit

Our business involves building of highly special custom built transportation vehicles, which requires maximum flexibility in working hours and conditions for our highly skilled labor, most of which must be trained over a period of years. The reduced revenues of our customers will not permit increase in the sales price of our equipment; therefore tremendous increases in costs result in almost an impossibility for making any profit, which does not make possible increases in wages necessary to provide the proper income for our workers on limited hours. Unless this condition can be corrected, we cannot hope to hold our position in our field.

From a manufacturer of motor coaches, delivery vehicles, trolley buses, etc.

Steel Code Prices Penalize Buyer

We use nothing but steel in our factory. With the new steel code in effect, a price of 10c per 100 lb. above the jobber's price has been put on the manufacturer. We as manufacturers use more sheet steel in building windmills than any jobber in our state. This should be corrected. We should not be penalized by the Steel Institute code.

From a manufacturer of windmills, pumps, cylinders and farm water equipment.

* * *

Condemns Absorption of Independent Structural Steel Plants

Absorbing of independent structural steel plants by the larger steel corporations and not permitting purchases of tools from outside sources has meant a considerable loss of business previously enjoyed.

From a manufacturer of punches, dies, rivet sets, etc.

* * *

Revive Capital Goods

Until capital goods revive NRA will hinder us.

From a manufacturer of cast iron heating furnaces and boilers.

* * *

Conforming, but Competitors Do Not

We have worked on the President's plan since the first of August. Some of our competitors are still at large, using the situation to their advantage, through delay in getting into line. Will doubtless hold out until the big stick is laid on them, but in the meantime are sailing freely while they are still in the open waiting for Uncle Johnson to call on them. It seems unfair to those working under NRA.

From a manufacturer of flexible shafts and machines for portable work.

* * *

Operating Results Worse as Surplus Dwindles

Present conditions are rapidly depleting surplus and working capital by advancing cost of doing business, and price advances of our own product will not take place rapidly enough to take care of it. Hence operating results are worse than a year ago in the face of a larger business in 1933 over 1932.

From a manufacturer of iron forgings.

* * *

(***Further comments on this subject will appear in*** THE IRON AGE ***of Jan.*** 11).

Interlake brands spell *Dependability* in Quality, analysis and delivery

PIG IRON

FEDERAL
PERRY
TOLEDO
ZENITH

All Grades

COKE

CHICAGO
SOLVAY
PERRY
TOLEDO
ZENITH

For Foundry, Industrial and Domestic Uses

INTERLAKE IRON

CORPORATION

PLANTS CHICAGO DULUTH TOLEDO ERIE

PIG IRON

PICKANDS MATHER & CO. SALES AGENTS

CLEVELAND CHICAGO DETROIT ERIE TOLEDO MINNEAPOLIS DULUTH

COKE

Welding Progress Features Speed and Quality

(Concluded from Page 131)

members, at a fraction of the cost of new parts, featured this work.

High-Production Brazing of Steel Assemblies

IN the field of continuous-furnace brazing of steel assemblies, one company announced development of a low-cost reducing atmosphere, which, together with the necessary furnace equipment is expected to widen the economic application of this quantity-production process. This joining of steel parts, such as stampings, forgings and screw machine products, is accomplished in electric furnaces with controlled reducing gas atmosphere at temperatures ranging from 1400 to 2100 deg. F. The assembly of parts is heated to the melting point of the brazing medium used and the parts cooled in the same reducing atmosphere to a temperature at which the parts will not oxidize in air upon removal from the furnace. Brazing materials include silver solders, brass and copper. Furnaces of belt conveyor or of simple pusher-type are employed. The low cost reducing atmosphere is produced at the furnace location by a gas producer of a suitable size. It is said to be practical to anneal or heat treat brazed assemblies at the same time as the brazing is performed.

A copper hydrogen welding or brazing installation described during the year centered around a furnace capable of handling as many as 1000 pieces at one time. In addition, each piece may involve a dozen or more welds, and a car of welded parts is discharged from the furnace every 4 min. The ferrous parts are passed through a hydrogen filled electrically - heated zone at 2100 deg. where the copper, previously applied to the seams, alloys with the iron to form a continuous gas-tight bond. This bond is said to have proved to be much stronger than the steel itself. The welded parts emerge clean and free from scale or oxides, inside and out, which is emphasized as a special advantage in the case of inclosed objects, such as tanks, headers and floats, where a subsequent cleaning operation would be difficult if not impossible. Parts illustrated included a header for a multiple refrigeration installation, assembled by the hydrogen welding from a length of tubing, stamped end-plates and screw machine made fittings.

Large Structures Welded

Several impressive new applications of welding were described in the technical and trade press during the past year. One was the welded steel housing of an 84-in. four-high sheet mill, believed to be the most powerful cold rolling mill ever built. Four 33-ton forged-steel links were welded together to form each housing, each link being flame cut from an 8½-in. thick slab.

Welded steel construction was adopted for the crankcase and other parts of a 1000-hp. twin-six Diesel engine. The welded crankcase, built of a high-strength alloy steel, has a weight of 2.6 lb. per hp. The entire engine weighs less than 10 lb. per hp. —running on the test block. Calculated from the indicator card, each weld is said to be subjected to an impact load of 38,000 lb., occurring 12 times each second. The crankcase of a 10-cylinder 600-hp. radial aircraft engine, was also built of welded steel, its weight is less than 1 lb. per hp.

Welding of the eight very large gates that are to control the supply of water to the turbines at Boulder Dam was an outstanding project, because of the size of the structure and the welding and other problems involved. Each gate valve and nose liner consists of six segments bolted together to form the complete cylinder. The lower gate valves weigh 240,300 lb. The outer shell of each segment of the lower gates consist of 2-in. thick plate bent to diameter and reinforced with 2¾ x 11¼-in. bars. Between each rig are 1½-in. thick bracing plates to provide stiffness in the vertical direction. The circumferential ribs and braces are continuously welded to each other and all were joined to the outer shell with ½-in. fillet welds. All welding was done with heavily-coated electrodes, and in a horizontal position. Of the more than 2300 tons of material required for these gates, 1720 tons was copper-bearing steel plates.

Erection of a field plant at Boulder Dam to fabricate by fusion welding and to test by X-ray some 15,000 ft. of penstocks ranging in diameter from 8½ to 30 ft. was also featured in the news of the year. The pipe was made from steel plate ranging in thickness from ⅞ to 2¾-in. and requires more than 400,000 linear feet of welding. Equipment at this field plant includes large bending rolls, plate planers, automatic welding machines, a 300,000 volt portable X-ray machine, and a car bottom type furnace, believed to be the largest of its kind, for stress relieving the welded pipe. When installed, this welded penstock will convey water from the Black Canyon to and from hydraulic turbines having a combined horsepower of 1,800,000 hp.

OF COURSE—THEY ARE EFFICIENT
SURE—THEY ARE ADAPTABLE
and SATISFACTION—IT'S GUARANTEED

"HOPKINS" AIR and HYDRAULIC EQUIPMENT

CHUCKS
CYLINDERS
VALVES
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WABIK METAL

Beautiful and useful products reflect the quality of the base metal as well as the craftsmanship of the designer and manufacturer. "Wabik Metal" is a base metal of proven quality in the production of vitreous enameled commodities whether of ordinary design or for parts requiring intricate and difficult drawing operations.

EMPIRE
SHEET & TIN PLATE COMPANY
MANSFIELD, OHIO

Sales Offices: New York • Dayton • Cleveland • Indianapolis
Chicago • Detroit • St. Louis • Minneapolis

Iron and Steel Industry Completes a Year of Pronounced Recovery

(*Concluded from page 138*)

contracted for before the end of the quarter.

Expansion in "Miscellaneous" Uses of Steel

Expansion of inventories probably fails to account for all of the difference between steel production and apparent consumption. Whereas consumption by the conspicuous outlets for steel failed to increase in proportion to steel output, little is known about the consumption of the large unclassified group of steel users, manufacturing a wide variety of products, which has been labeled "miscellaneous." This group has taken more steel proportionately during the depression than it did during the prosperous '20's. In 1932 it accounted for 25½ per cent of all the finished steel made; in 1931 and 1930 its share was 20½ per cent. The consumption of the miscellaneous group has shown a relative gain either because its steel needs are less subject to curtailment than those of other groups or because its requirements have been expanding in keeping with the trend toward greater diversification in uses of steel. Doubtless both factors must be taken into account.

Increase of 8.6 Per Cent in Steel Prices

The influence of the code on finished steel prices may be roughly measured by comparing THE IRON AGE composite at the end of 1933—2.028c. a lb. —with the low reached on April 18—1.867c. a lb. The increase was $3.22 a ton, or 8.6 per cent. Actually the rise was somewhat greater because the steel code prohibits the waiving of extras, a practice that was not uncommon during periods of sharp competition.

Although prices have advanced, costs have likewise soared. In fact, with the labor situation highly unsettled, it is a question whether the steel industry will succeed in its efforts to increase its revenues faster than its wage costs.

Artificial vs. Natural Stimuli

It is also a question whether the artificial stimulus given to business by codification and other extraordinary measures sponsored by the Government has brought the industry much more tonnage in the aggregate than it would have booked in the absence of such influences. British steel ingot production has shown a steady gain, making allowance for seasonal variation. Striking a low of 361,500 tons in August, 1932, British output has increased ever since. The course of American production has been much more erratic than that of British output. While American output has shown a greater gain, the rise in British production appears to have been healthier.

Pig Iron Production Up 52 Per Cent

Pig iron production in 1933 did not keep pace with steel ingot output. The year's make is estimated at 13,200,000 tons, compared with 8,686,000 in 1932 and with 18,275,000 tons in 1931. These figures include blast furnace ferroalloys but not charcoal iron. The 1933 gain of only 52 per cent, as compared with a 71 per cent increase in steel ingot production, is probably accounted for by enlarged scrap consumption. Pig iron production reached the lowest point of the year during March, amounting to only 17,484 tons daily, as compared with a 1932 low of 17,115 tons daily reached in August. During August, 1933, United States furnaces poured iron at a rate of 59,142 tons daily, the highest of the year. The peak in steel ingot production was reached during July. After a steady decline through September, October and November, iron production apparently increased slightly in December, although the gain was by no means as pronounced as in the case of steel output.

Pig iron prices, having reached a lower level comparatively than those on finished steel, increased more rapidly. THE IRON AGE composite price of pig iron remained at $13.56 a gross ton during the entire first quarter, obviously below the actual production costs of all except Birmingham district furnaces. Large stocks of iron had been accumulated at most centers and competition among sellers in various producing districts was keen. Foreign iron was also offered at low levels along the Atlantic seaboard. With the return of demand in the second quarter, pig iron quotations were quickly stabilized and the composite price rose steadily throughout the remainder of the year to $16.90 a ton in December. The increase of $3.34 a ton or 24.6 per cent was considerably greater than the gain of 8.6 per cent in finished steel prices. However, the higher figures did not apply on much iron shipped during 1933 as most of the larger buyers were covered by contracts against which shipments were required by the code to be completed by Dec. 31.

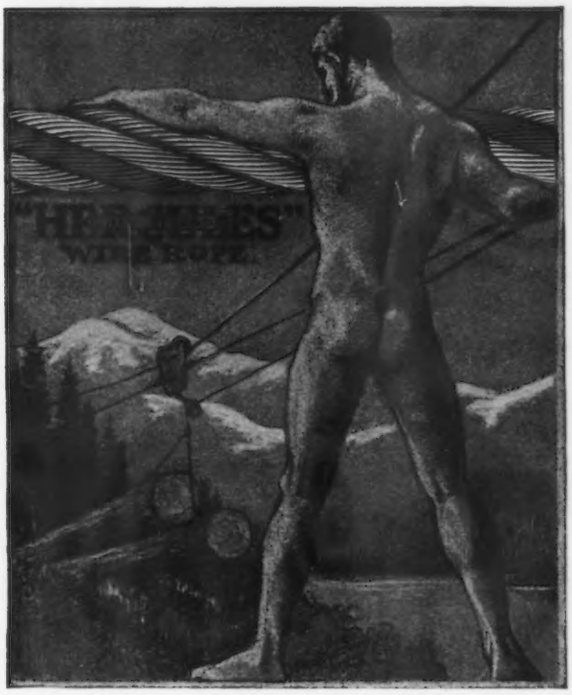
In the last half of the year, pig iron silicon differentials were revised and firmly established and price variations between the various grades of iron were made uniform in all districts. Basic iron was quoted at 50c. a ton under the malleable and foundry grades, while Bessemer commanded a premium of $1 over basic. All Lake furnaces quoted the same prices while Atlantic seaboard producers also adhered to common schedules. Under the code, Southern iron was uniformly quoted at a concession of 38c. a ton under the delivered prices of Northern iron in the territory north of the Mason and Dixon line.

Scrap Prices Fluctuate Widely

Scrap prices moved over a wide range during the year, reflecting as usual the fluctuations in steel ingot production. From a low of $6.75 in January, THE IRON AGE composite price of scrap rose to $12.25 a ton in August, but followed the decline in ingot output in the following months to an average of $9.94 in November. In the last week of the year, it had risen to $11.08, with continued strength reported from all districts. Ordinarily, this would indicate a continued rise in steel output during January, but other factors may have confused the situation in this instance. Dealers and makers of scrap have been more reluctant to sell in recent months because of inflationary tendencies at Washington. The export movement along the Atlantic seaboard has continued and this outlet has helped to prevent the accumulation of distress tonnages which ordinarily depress the market. The comparatively high level of pig iron prices has also encouraged dealers to wait for an adjustment.

STEEL INGOT PRODUCTION

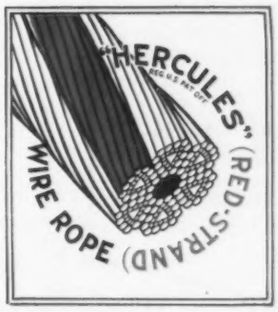
	British Monthly Totals (Tons)	Index No.	American Daily Averages by Months (Tons)	Index No.
1932				
August	361,500	100	31,360	100
September	430,300	119	38,148	122
October	438,500	121	41,810	133
November	473,800	131	39,701	127
December	430,400	119	33,117	106
1933				
January	444,400	123	39,618	126
February	482,700	134	45,286	144
March	577,700	160	33,699	107
April	513,300	142	54,514	174
May	599,600	166	74,148	236
June	568,800	157	99,904	319
July	567,500	157	128,152	409
August	551,300	153	107,430	343
September	669,000	185	88,884	283
October	668,300	185	81,225	259
November	695,000	192	59,265	157



Where Endurance Is the Means to Real Economy

Heavy loads, high speeds, sharp bends, sudden jerks, severe wear—these are only a few of the conditions a wire rope encounters during a day's work.

As is well known, wire rope economy depends largely upon the ability of the wire rope used to withstand these conditions; and it is on this basis that "HERCULES" (Red Strand) Wire Rope continues—day after day—to make and hold friends.



There are good reasons for the unusual sturdiness and wear resisting ability of this wire rope, among which is the fact that it is made of acid open-hearth steel wire; moreover, every wire put into it is first rigidly tested by us to make sure that it meets our exacting specifications. We would be glad to give further particulars to anyone interested in saving money on their wire rope purchases.

Made Only by **A. LESCHEN & SONS ROPE CO.** Established 1857

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Chicago - - - 810 W. Washington Blvd.
Denver - - - - - - - 1554 Wazee Street
San Francisco - - - - 520 Fourth Street

Automotive Curve Rises and Industry Prepares for 1934

(*Continued from Page 97*)

customers, "You asked for certain features in your next car. We have built them into our car for you. Here is the car." This, of course, is the antithesis of high pressure selling which heretofore animated General Motors.

In contrast with this method is the high pressure tactics which Chrysler has intensified rather than relaxed. These tactics brought it fresh honors in 1933 and it is safe to predict that the same general merchandising approach will be employed the coming year.

With reference to selling methods one should not overlook the metamorphosis in the last month of the Ford organization. It has appropriated the best sales policies of its competitors and is spreading information about its products by means of newspapers, moving pictures, radio, international telephone and other strictly modern media. Without question this will have the effect of putting Ford back into the running for first place in volume in 1934.

A sufficient number of good retail outlets constitute the lifeblood of the automobile manufacturer. He may have the best car in the world, but without adequate retail distribution he is lost. It is significant that the three leaders now have 31,629 out of the country's total of 38,092 dealers. General Motors has 16,349 dealers, Ford 8280 and Chrysler 7000. This leaves only 6500 dealers for all other companies. Small wonder that the independents are losing ground.

DOMESTIC PASSENGER CAR REGISTRATIONS

FIRST TEN MONTHS OF 1933 AND 1932

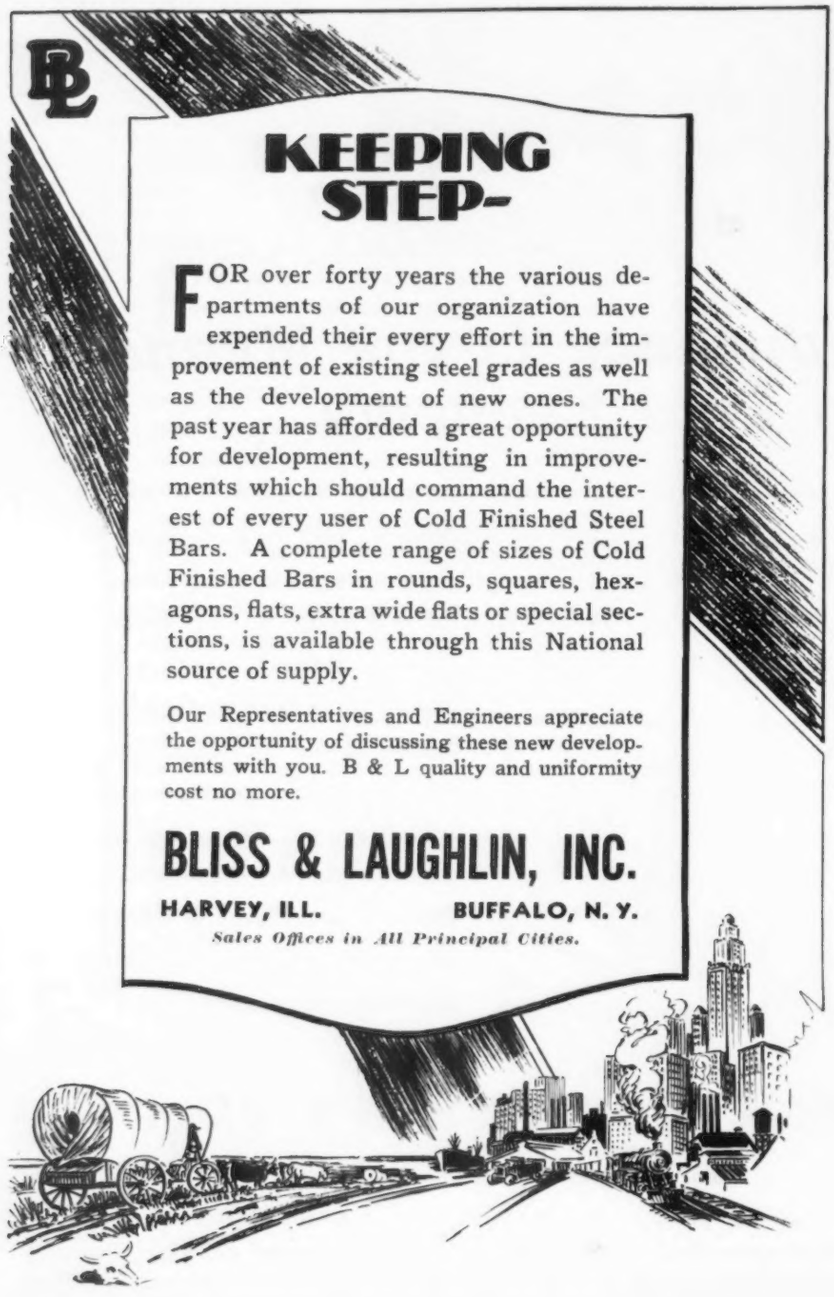
Low Price Group:	1933	1932
Chevrolet	438,888	305,763
Ford	271,994	232,125
Plymouth	218,491	95,599
Terraplane	32,978	26,112
Willys	13,975	20,887
Austin	3,387	1,662
Continental	2,504	....
High Price Group:	**1933**	**1932**
Packard	8,097	10,120
Cadillac	3,592	5,826
La Salle	3,350	3,456
Lincoln	1,914	2,800
Pierce-Arrow	1,776	2,481
Medium Price Group:	**1933**	**1932**
Pontiac	78,760	44,585
Dodge	75,254	24,842
Buick	41,326	46,477
Oldsmobile	32,612	22,658
Chrysler	26,678	24,620
De Soto	19,340	23,844
Studebaker	14,832	23,333
Rockne	14,366	15,245
Graham	9,069	11,962
Nash	8,704	19,160
Hupmobile	6,003	9,937
Auburn	4,636	11,138
Reo	3,082	3,561
Franklin	1,180	1,577

Above figures are based on report made to R. L. Polk & Co.

Industry Insists on Merit Clause

A review of the year's happenings would not be complete without a brief recital of the industry's part in the NRA program. In the adoption of a code it was the sole industry to have written into its agreement and approved by the President a merit clause giving management the right to hire and discharge employees without regard to union or non-union affiliation. The code, which ran until the end of the year, has been extended until next September with the merit clause still in it.

(*Continued on Page 180*)


KEEPING STEP-
FOR over forty years the various departments of our organization have expended their every effort in the improvement of existing steel grades as well as the development of new ones. The past year has afforded a great opportunity for development, resulting in improvements which should command the interest of every user of Cold Finished Steel Bars. A complete range of sizes of Cold Finished Bars in rounds, squares, hexagons, flats, extra wide flats or special sections, is available through this National source of supply.
Our Representatives and Engineers appreciate the opportunity of discussing these new developments with you. B & L quality and uniformity cost no more.
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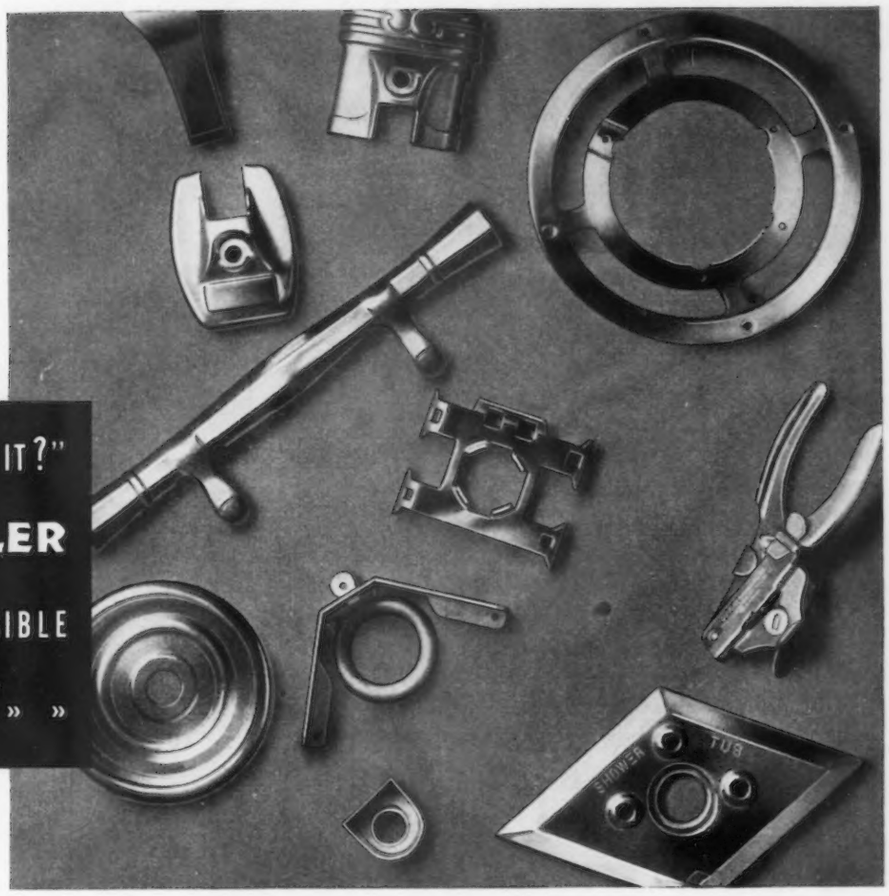


"NO ONE ELSE CAN MAKE IT?"

DICKEY-GRABLER

HAS DONE THE IMPOSSIBLE

MANY TIMES BEFORE » »

TOUGH jobs gravitate to DICKEY-GRABLER, precision die makers to industry and manufacturers of light, difficult stampings.

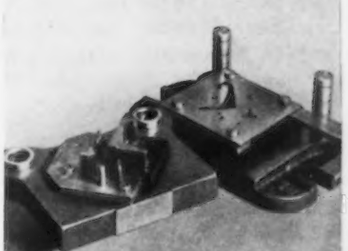
Invar struts for aluminum pistons—90-odd types of them, some of 32% nickel steel; rayon spool caps held to .003" accuracy in stainless steel; a pipe cutter disc with cutting edge coined; a casket handle assembly; gas pump gallonage indicators—these are a few of those considered "impossible" in their degree of accuracy.

Dies made in our shops are made by craftsmen, long skilled in our methods of precision manufacture. You specify the degree of accuracy you need in production, and DICKEY-GRABLER men will meet your requirements *. . . not almost, but exactly, and on time.*

Many manufacturers who want these fine precision dies learn that producing the required stampings is more economically handled in the DICKEY-GRABLER plant than in their own . . . consequently we produce large quantities of stampings for our customers from the dies we have built for them. DICKEY-GRABLER ships no rejects to customers, for DICKEY-GRABLER has none.

Engineering service is available to manufacturers requiring assistance in designing production dies for maximum service, and we will gladly quote on your requirements, large or small. THE DICKEY-GRABLER COMPANY, 10304 Madison Avenue, Cleveland, Ohio. *Detroit Representative*—514 Buhl Bldg., CADillac 8428.

PRECISION DIES



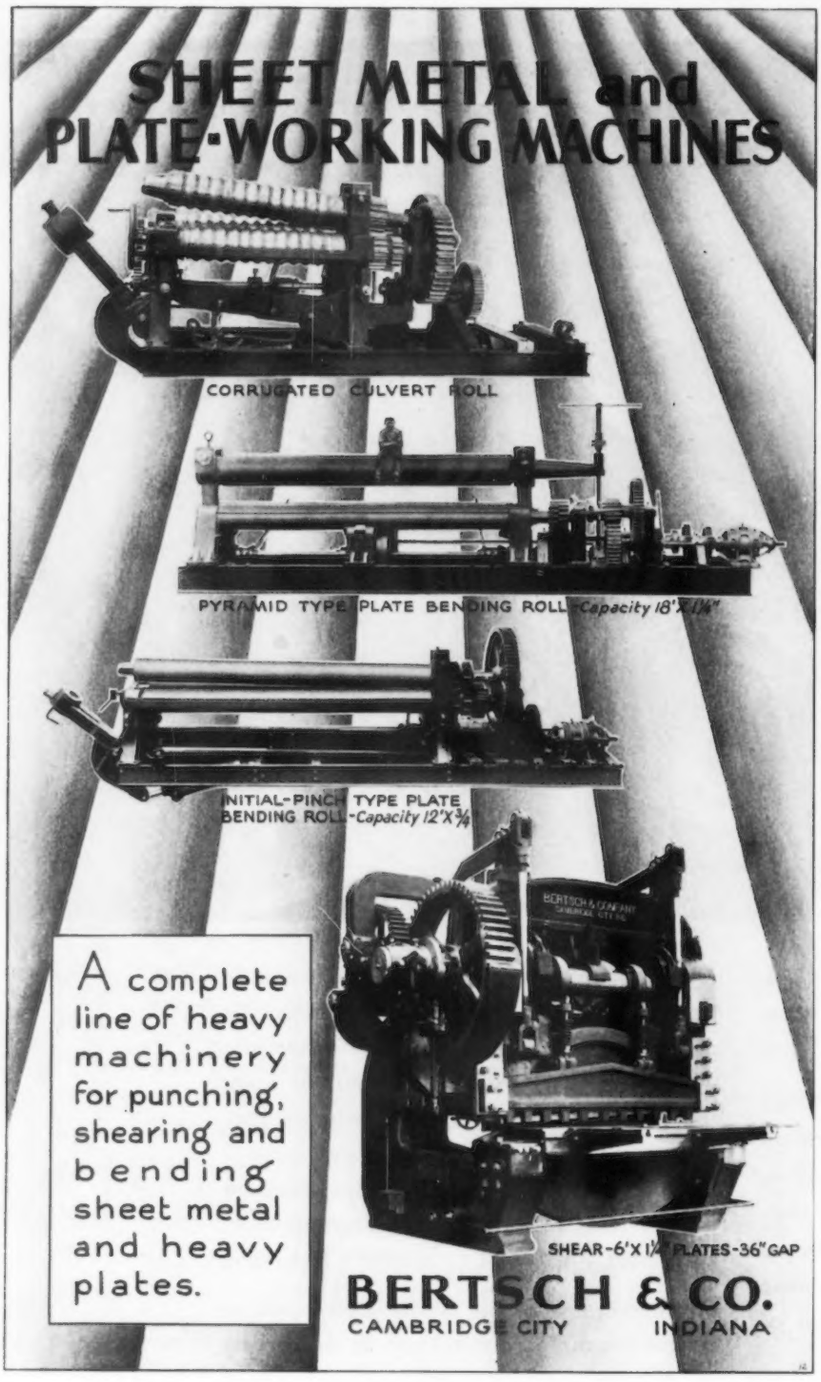
FOR PRODUCTION

DICKEY-GRABLER

PRECISION DIES • LIGHT STAMPINGS • MARKING DIES

● *Dickey-Grabler makes a complete line of Brass Checks and Name Plates*

MORE THAN 50 YEARS OF SERVICE


SHEET METAL and PLATE-WORKING MACHINES
CORRUGATED CULVERT ROLL
PYRAMID TYPE PLATE BENDING ROLL-Capacity 18'X1¼"
INITIAL-PINCH TYPE PLATE BENDING ROLL-Capacity 12'X¾"
SHEAR-6'X1¼" PLATES-36"GAP
A complete line of heavy machinery for punching, shearing and bending sheet metal and heavy plates.
BERTSCH & CO.
CAMBRIDGE CITY INDIANA

(*Continued from Page* 178)

Under the code members of the National Automobile Chamber of Commerce increased their employment 20 per cent, adding 25,100 workers, and their payrolls 16 per cent from July to September, despite a decline of 8 per cent in man-hours worked. Alfred P. Sloan, Jr., president, General Motors Corpn., declared recently that in September increased labor cost under the code amounted to an average of $31 on each General Motors car. One might add to this amount $12 to $15 for materials.

It is not likely that all of this burden will be passed along to the car buyer in 1934. Manufacturers will count on increased volume, resulting in lower cost per unit produced, to offset some of the expense. Ford's schedule, boosting prices $5 to $30, is probably representative of what is to be expected in the low-price field. It must be remembered in this connection that the motorist is going to get more for his money than he did the past year, for the trend toward bigger and better cars has not halted.

What of 1934? Leading executives are wary about being pinned down to any definite figure, and the important companies are not making the mistake of setting up impossible goals for their men to shoot at. However, there is a deep underlying feeling of confidence, and conservatively the industry puts its production and sales for the next 12 months at 2,800,000 units. Export business is expected to contribute in larger measure to the industry's 1934 performance than it has in four years, although fluctuations in exchange rates and alterations in tariffs make predictions precarious.

CHEVROLET AND FORD PRODUCTION IN 1933

	Chevrolet	Ford
January	64,594	19,000
February	45,417	16,000
March	38,664	39,000
April	59,953	47,000
May	68,540	54,000
June	81,573	60,000
July	80,250	62,000
August	73,433	68,500
September	59,357	53,500
October	37,699	40,500
November	2,500*	18,000
December	25,000*	42,000
Total	636,980	519,500

*Estimated.

NOTE—Chevrolet figures, with exception of November and December, were furnished by the company. Ford figures are unofficial but close estimates based on the industry's statistics.

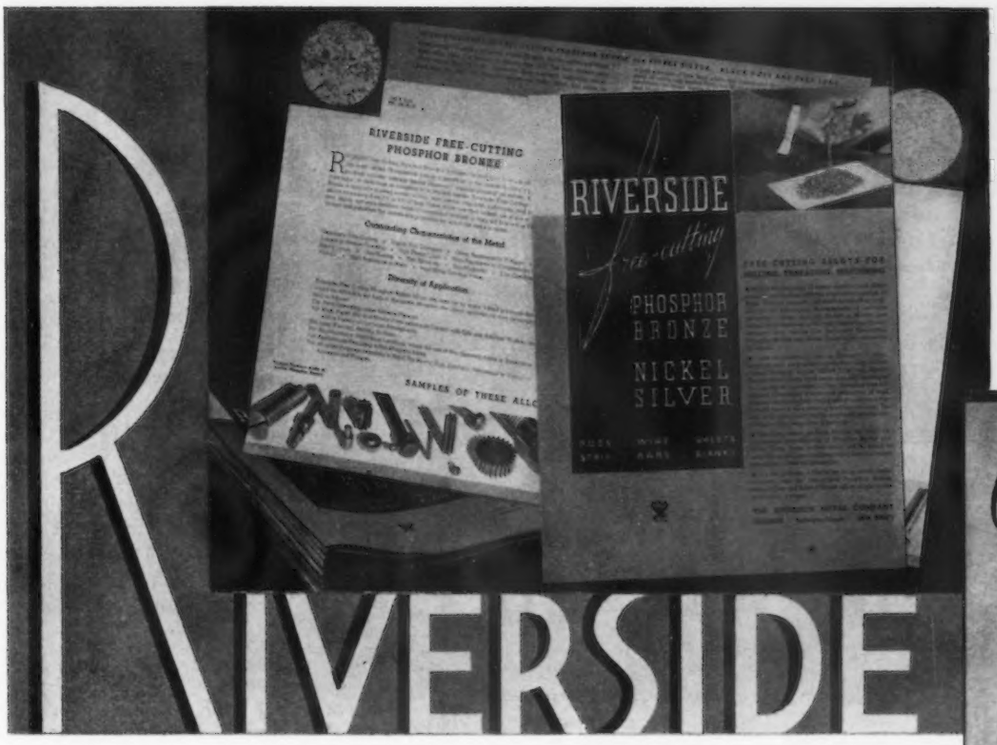
Authorities agree that a tremendous replacement market exists today, what with eight million obsolete cars on the highways and five million more scrapped in the last two years than were bought. The fact has been demonstrated that motor cars no longer are a luxury but a necessity and that resuscitation of buying power is immediately reflected in improved sales. This has been proved recently in the contra-seasonal maintenance of sales volume in districts

COMMERCIAL CAR REGISTRATION

FIRST TEN MONTHS OF 1933 AND 1932

	1933	1932
Chevrolet	91,146	55,670
Ford	52,361	57,992
International	22,496	14,093
Dodge	21,159	7,784
General Motors Truck	5,524	5,540
Diamond T	3,524	1,942
Reo	2,515	2,904
Studebaker	1,683	2,173
Mack	1,288	1,275
White	1,185	1,938
Federal	1,102	1,010
Indiana	1,086	817

(*Continued on Page* 182)



- RODS
- SHEETS
- STRIP
- WIRE
- BARS
- BLANKS

NRA MEMBER U.S. WE DO OUR PART

Get your Copy

FREE-CUTTING PHOSPHOR BRONZE and NICKEL SILVER for MILLING, THREADING, MACHINING

Most manufacturers of screw machine and allied products are familiar with the machining qualities of Brass. There is, however, not much information available on the free-cutting characteristics of the more refractory metals, such as Phosphor Bronze and Nickel Silver. Because of this lack of data some manufacturers may assume that genuinely free-cutting Phosphor Bronze and Nickel Silver alloys cannot be obtained.

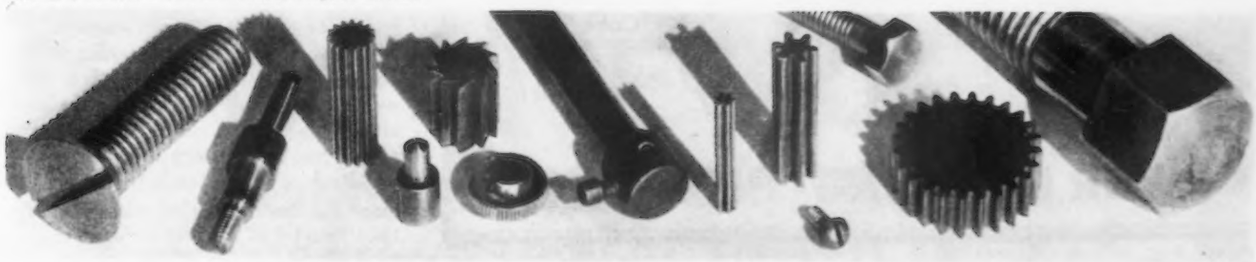
These manufacturers may be interested to learn, therefore, that we produce a complete range of free-cutting Phosphor Bronze, Nickel Silver and Special Bronze alloys which have been specially developed for high speed, automatic milling, threading and machining. Containing a balanced proportion of lead, they are genuinely free-cutting and process smoothly without fouling the cutters or burning the tools. The ease with which they can be machined permits fabrication within very close tolerances. Therefore, where products require the many advantageous characteristics of Phosphor Bronze and Nickel Silver, these leaded alloys will be found to maintain all their essential properties, plus the added advantage of free machinability.

We have prepared a folder for the purpose of acquainting manufacturers with the free-cutting Phosphor Bronze, Nickel Silver and Special Bronze alloys which we are in a position to supply. A letter will bring you a copy.

THE RIVERSIDE METAL COMPANY

RIVERSIDE Burlington County NEW JERSEY

Typical Products made of leaded Phosphor Bronze



(Continued from Page 180)

where government checks for crop restrictions have been distributed.

A source of gennuine concern to manufacturers, of course, is the rising tide of new car prices concurrent with lower trade-in allowances on old cars effected by the retail automobile code. While the buyer is being asked to pay $25 more for his new car he is being allowed $50 less on his old car, so that the transaction actually is costing him $75 more than it did in 1933. Factories are eager to do everything possible to keep obstacles out of the consumer's path which might prevent him from buying a new car. Executives realize that this is no time to load him down with more expense than necessary or the retail market may freeze up again instead of thawing further.

However, even with this and other perplexing problems to be solved, the industry is in a buoyant mood. To a man it believes that 1934 will bring at least a reasonable increase in motor car sales over 1933. And that means not only more employment and larger payrolls at Detroit, but also greater expenditures for steel, for nonferrous metals, for plant equipment and for hundreds of materials items and parts which go into automobiles. The motor car industry is on its way up from the depression cellar. Its morale is high, its courage strong. It has adjusted itself to the economic changes of the day and is confident of its future.

THE SHENANGO FURNACE CO.

Lake Superior Iron Ores

Bessemer Non Bessemer
Aluminiferous

Shenango Pig Iron

Bessemer Basic
Malleable Foundry

SHENANGO-PENN MOLD CO.

Ingot Molds

Centrifugally Cast

Bronze Bushings

W. P. SNYDER & COMPANY

Established 1888

Iron Ore Pig Iron
Coal Coke

OLIVER BUILDING · PITTSBURGH

Steel Industry Tries Self-Government

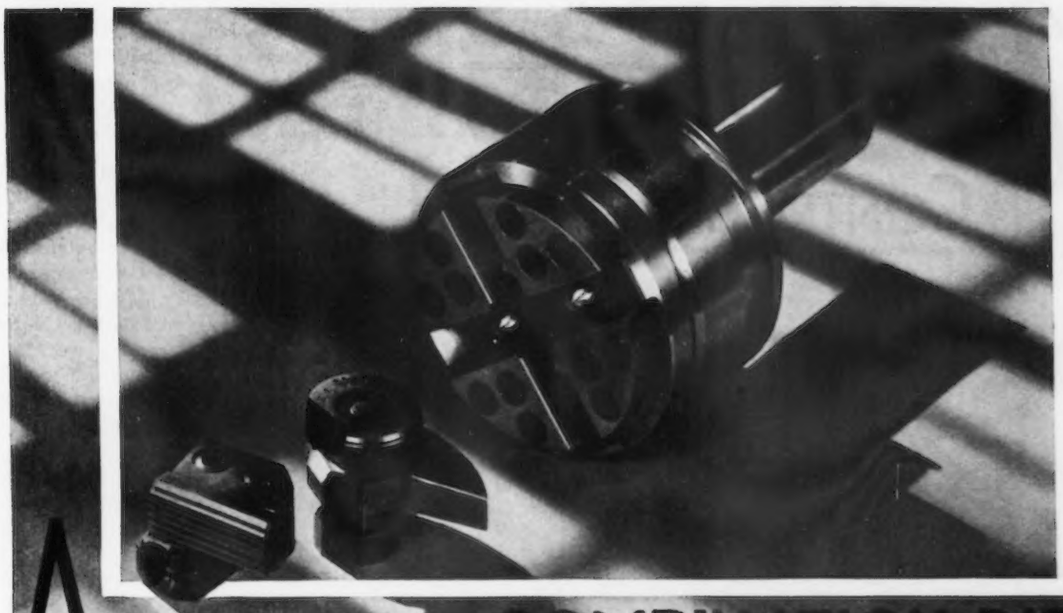
(Concluded from Page 50)

procity business of this type is not necessarily harmful and could hardly be eliminated.

Standardization Possible

Under the code, great progress has already been made in the simplification and standardization of extras and differentials. Their publication by the institute has been of great service to both the buyer and seller. Further important progress along these lines is promised by the recent appointment of a technical committee which will concern itself with the nomenclature of new products and with revision and standardization of other lines which have led to confusion in the past. It is possible also that this committee will become interested in establishing fair charges to be made for extras. Many such charges are meaningless today, having been set by some company in the past and followed by others without investigation. As an example, the extra for a certain alloy content in one product is $1 a ton, while on another related product it is $2 a ton. Recommendations of the technical committee with regard to such procedure would surely be adopted by the industry.

The establishment of more equitable base prices under the code is not so simple, as the institute has no authority to set such prices. However, through its commercial committee and the various sub-committees having to do with individual products, it is able to make analyses of costs of production which might well govern the setting up of prices. It is quite conceivable that the future may see the establishment of a price structure, starting with pig iron and continued through the entire line of finished steel products which would have a scientific basis in production cost. The desirability of such a plan is self-evident. It is safe to say that no objections would be made by the enlightened buyer who would welcome a price structure which placed him on the same basis as all his competitors and assured a satisfactory profit to all. "No more haggling in the market place" might then be said of a great industry.



ANNOUNCING A COMBINATION DIE HEAD

TO USE

EITHER CIRCULAR OR TANGENT CHASERS

IN case of long runs of identical threads, or much unavoidable chaser breakage, some users prefer a die head designed for circular or tangent chasers.

To meet this need, a die head built to Geometric's exacting standards and representing several years of development now supplements the Geometric line. It accommodates circular and tangent chasers interchangeably—thus making the smooth operation, easy accessibility, and long life peculiar to Geometric construction available to devotees of either style of chaser at the cost of one tool!

Outstanding advantages over other similar die heads are:

SHORTER CHASER GRINDING TIME—Either style of chaser with its holder can be quickly extracted without removing the die head from the machine—ground and set—and replaced in the head . . . all in much less time than has ever attended the grinding of circular and tangent chasers.

MAXIMUM NUMBER OF GRINDS—The circular chaser is provided with means for both coarse and fine adjustments; the first by serrations within its bore, the second by opposing screws which permit any degree of adjustment ***between serrations.*** An equally fine adjustment can be given the tangent chaser by an abutment screw. Therefore, no more than just enough metal to leave a clean cutting surface need ever be removed—which greatly lengthens the useful life of the chasers.

RIGID CHASER HOLDER SUPPORT is afforded by heavy "T" slots and broad reinforcing wings riding on the face of the die head.

RIGID CHASER SUPPORT—Dislocation of the circular chaser by wear and strain is prevented by having its center post integral with the holder. The firmest possible support is given the tangent chaser by a binding screw construction that draws it firmly into the dovetail of the holder and solidly against the shoulders of each side of the dovetail.

This new die head is now available through the regular Geometric outlets and we will gladly send you a

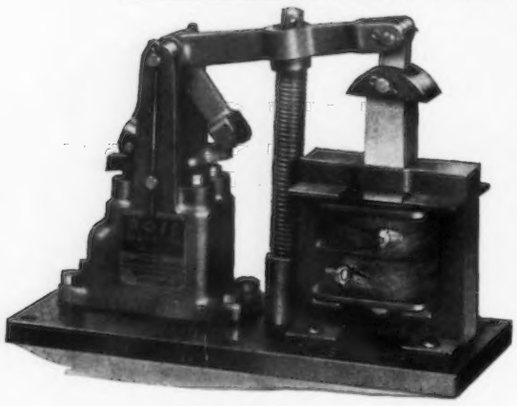
DESCRIPTIVE BOOK ON REQUEST

GEOMETRIC

COMBINATION DIE HEAD

A PRODUCT OF THE GEOMETRIC TOOL CO., NEW HAVEN, CONN., U. S. A.

New ROSS SOLENOID CONTROL VALVES



---the Ideal Method of Reducing Air Costs

INTENSIVE research by Ross engineers has led to the development of solenoid control for all standard size Ross operating valves.

With the New Ross Solenoid Controlled Valves, for either A.C. or D.C., installed adjacent to air cylinders, extra piping is eliminated, thus cutting down on air waste. You get the convenience of remote control together with added air economy.

Unit is of compact, rugged construction. Removal of either valve or solenoid for inspection is obtained without disturbing remainder of unit. Adaptable for single or double acting cylinders with pipe sizes from 3/8" to 1 1/4".

Standardize now on Ross Operating Valves. Obtainable for hand, foot, mechanical, and now also for solenoid control.

Write for Complete Details

ROSS OPERATING VALVE CO.

6488 EPWORTH BLVD. DETROIT, MICH.

The Farmer as a Metal-Industry Customer

(*Concluded from Page* 136)

ly inclined to follow American methods of farming. The credit situation in South America remains unfavorable to wire and sheet producers.

Near the end of 1933 farmers accelerated their use of steel fence posts after carrying through most of the year at a lower average rate of use than in 1932. During the years of depression many farmers cut their own posts, thereby only deferring a few years the purchase of the far more permanent steel post. Creosoted wooden posts have been offered to the farmer, but at a price close to that of steel and the idea has not taken hold. Volume of steel posts moved in 1930 was about eight times the 1933 volume, but the trend is once again upward and the spring season for fence work is expected to prove more satisfactory than for several years. Interest in barn equipment is growing, but increased sales are barely noticeable. However, barn equipment is increasingly important to the farmer and he will take his needs as soon as buying power permits.

Steel Structures on Farms

Rapid strides have been made in the past year in the use of steel structures on farms. The value of all farm structures and their contents is in excess of $23,000,000,000. Annual replacement calls for 150,000 barns, not to mention milk houses, silos, corn cribs, poultry houses, hog houses, implement sheds and dwellings. Steel construction is the answer to annual farm structure losses, which are $70,000,000, resulting from blazes of unknown origin; $30,000,000 due to spontaneous ignition; $12,000,000 resulting from lightning; $40,000,000 damage by wind storm; and $240,000,000 the direct loss that comes from deterioration. Live stock men, dairymen and farmers with herds and flocks have not only animals to protect, but also valuable forage crops that are put in storage. The pioneer work in this field was done in 1933 and real expansion can reasonably be expected in 1934.

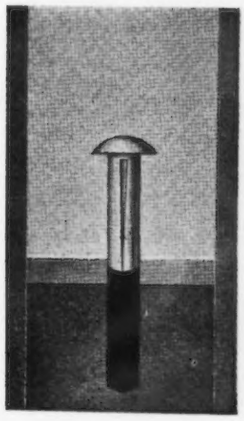
Sales of Implements Increased Last Year

To sum up, it is estimated that sales of farm implements in 1933 exceeded the 1932 volume by 10 per cent, and some manufacturers believe that 1934 sales should be at least double the 1933 volume. Farmer and dealer credit is improving and bonuses to be passed out in 1934 give assurance that this improvement will continue. Producers of wire products point to this situation and to pressing unfilled needs to bring 1934 sales well above the figure of last year. The upturn in demand for steel fence posts was under way last fall and continued to the end of the year. If better credit conditions help the wire products business they are bound to be reflected in broader demand for steel posts and sheet mill products.

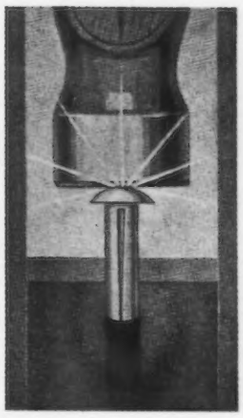
Bonuses Will Boost Farm Buying Power

Estimated bonuses, based on farmers signing up 100 per cent, are: $155,000,000 to corn growers, $225,000,000 to hog raisers, $148,000,000 to wheat areas, $89,000,000 to cotton growers, and also $12,000,000 to tobacco raisers. Most of this money will be distributed in 1934. The bonus to some middle-western farms will run as high as $300, while the average for all units in the United States will be about $100 per farm.

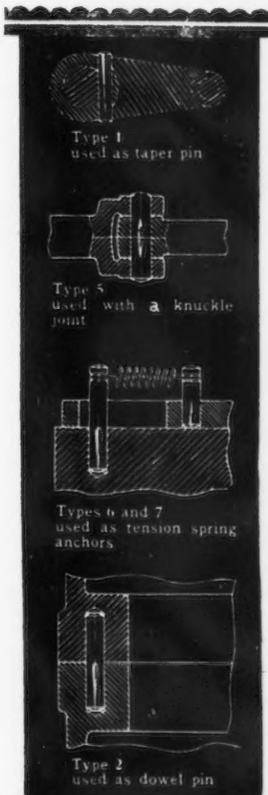
Are you using GROOV-PINS?



INSERT IN ANY DRILLED OR PUNCHED HOLE



DRIVE IT HOME!



assembly costs cut to the lowest limits

Reamer and tap breakages eliminated—labor costs reduced and a fixing that is more proof against vibration than screws or studs.

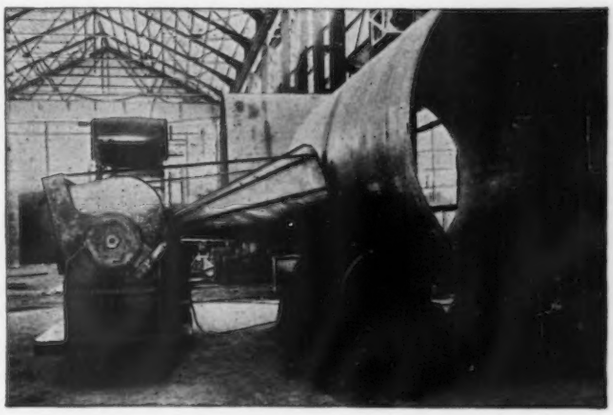
NO REAMING NO TAPPING

Simply drill a hole and drive home the pin

Write for full technical details and particulars of the many types and sizes.

GROOV-PIN CORPORATION
47-18 37TH STREET
LONG ISLAND CITY, N. Y.

Two More G-E X-Ray Units for BABCOCK & WILCOX



FOUR 300,000 volt x-ray units will shortly be in operation in the Babcock & Wilcox plants. Two are now in use, one at Barberton, Ohio, and the shock-proof outfit shown above "on location" at the Boulder Dam Project.

One of the pioneers in the industrial use of the x-ray, B & W soon found their G-E x-ray unit an invaluable tool for the non-destructive inspection of fusion welds in plate up to 4" in thickness. When faced with the gigantic task of x-raying 75 miles of seam in the Boulder Dam penstocks, they naturally turned to G-E for the necessary equipment. A 300,000 volt shock-proof unit, with all high tension parts oil-immersed, was adapted to this particular job, and has since been rendering excellent service "shooting" penstock sections up to 30 feet in diameter.

Schedules have been speeded up, however, so Babcock & Wilcox have ordered two duplicates of their Boulder Dam outfit, one of which goes to Boulder Dam, the other to Barberton. When they are placed in service, Babcock & Wilcox can boast the most entensive x-ray facilities in their field.

You may not have to check 4" welds, but that is only one of the industrial possibilities of the x-ray. If you have a problem of hidden defects, send for the new edition of "Industrial Application of the X-Ray." Address Industrial Department.

General Electric X-Ray Corporation

Branches in Principal Cities

2012 Jackson Blvd. NRA **Chicago, Illinois**

JUST BETWEEN US TWO

A Stainless Record—100% Wrong

"Sorry I did not take the advice when The Iron Age stated, 'Keep your eye on . . . Steel Company.' Its stock has mounted." So writes a subscriber.

Avid for praise as the next one, honesty compels us to deny that we ever gave this advice. Stock-tipping is too hazardous for our temperate blood. But we are thinking of issuing a market service based on our own personal experience.

It will undoubtedly be sensationally successful. Already we can see Roger Babson, Brookmire and the other forecasters swinging picks in the reforestation corps. For they are wrong only part of the time and therefore their services shall be far less dependable than ours. Our personal judgment regarding Wall Street is wrong all the time.

The "A.H.D. Stock Market Forecast" will carry in red ink this warning, "Guaranteed to be 100% wrong. Study our advice carefully, and do the opposite." Our clients will ride in Rolls-Royces and have a pair of suspenders for every pair of pants.

Forecast

Because of the perfect fallibility of our own personal forecasts (we must ring in the word "personal" lest anything said here reflect on the prescience of Iron Age editors), we quote this one in a letter written us by an astute, able advertising agent:

> *"Things look mighty good. The break will come in January, I think, and then have a lot of contract blanks dusted off for you will need them. The woods are lousy with new advertisers and most of the old ones."*

Just when we were convincing ourselves that 1934 would be a good year just because no one had concocted a sappy slogan about it, out pops the a.a.a.a. with this, "1934 *will reward those with their fountain pens filled.*" Well, it's too long to attain much popularity, and besides the pen nib people will do what they can to suppress it, so we are still hopeful.

It's Gotta Be News

The same a.a.a.a. insists that advertising is news. He's telling us! We who discovered that industrial readers depend as much on the advertising pages for ideas as on the editorial!

Funny thing about advertising, the men who write it are so often apologetic, as if what they write is forced on the reader. This inferiority complex would disappear like mist on a windshield when you snap on the wiper, if they spent a few days calling on trade paper readers.

Every good circulation man knows that the paper with the fat advertising section is the paper the readers want.

Crazy, Huh?

We have been trying to sell this swell idea to the management. Charge for advertising space on a sliding scale based on the quality of the ad. If the ad is terrible, $1,000; fair, $500; good, $100; a wow, gratis, or we pay for the privilege of publishing it.

In judging quality, news value would rate high. We would probably give an "A" in news value to that Cleveland Twist Drill ad on page 73 of Dec. 7, Iron Age. It contained an interesting table of employees' length of service, showing that *two-thirds of the employees have been with the company for more than ten years.*

Remember the days when a trade paper editor's idea of a good, snappy article was something telling how to keep down labor turnover? May they soon return.

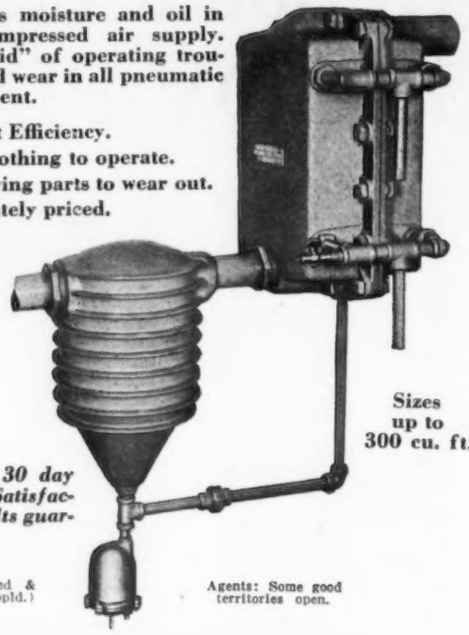
We wish a Happy New Year to all of God's chillun, particularly to Mrs. Addie V. Gregg, who runs a millinery store and blacksmith shop in Maywood, Neb.

A. H. D.

RUEMELIN COMPRESSED AIR DRYERS

Extracts moisture and oil in the compressed air supply. "Gets rid" of operating troubles and wear in all pneumatic equipment.

Highest Efficiency.
Costs nothing to operate.
No moving parts to wear out.
Moderately priced.



Sizes up to 300 cu. ft.

Sent on 30 day trial. Satisfactory results guaranteed.

(Patented & Pat. Appld.)

Agents: Some good territories open.

RUEMELIN MFG. CO.
1580 S. FIRST ST. MILWAUKEE, WIS.
(Mfr's Sand Blast & Dust Collectors)

Cimatool
DIAMOND and CARBIDE BORING MACHINE

SPEED, PRECISION AND ECONOMY

New demands for accuracy—for speed—for economy are being realized in the Cimatool Diamond Boring Machine. Built in both bench and table types, it offers unusual opportunities for boring pistons, connecting rods, electric motor frames and all kinds of cylindrical valves.

Boring cycle operation is automatic and production is exceptionally high, also accuracy can easily be maintained both as to alignment and diameter with "Cimatool."

You should acquaint yourself with the many advantages of Cimatool Boring Machine. Write for bulletin or send sample for estimate.

TABLE TYPE-

CITY MACHINE & TOOL WORKS
DAYTON ..... OHIO